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NATURAL HISTORY

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A GEOGRAPHER AT THE FRONT
BY DOUGLAS W. JOHNSON

CREATING A NATIONAL ART
THE FIRST EXHIBITION OF AMERICAN TEXTILES AND COSTUMES
BY HERBERT J. SPINDEN

SCULPTURES OF ROOSEVELT
WITH THE LAST BUST MODELED FROM LIFE

AULD LANG SYNE OF TREES

ARMY INTELLIGENCE TESTS, NEGRO RECRUITS, PYGMIES, PORTO RICO, JOHN BURROUGHS AND DISTINGUISHED BIRD PHOTOGRAPHS IN HIS HONOR, GARMAN, BOULENGER, WILD LIFE MEMORIAL TO ROOSEVELT, RETURN OF THE BISON, LLEWELLYN GLACIER

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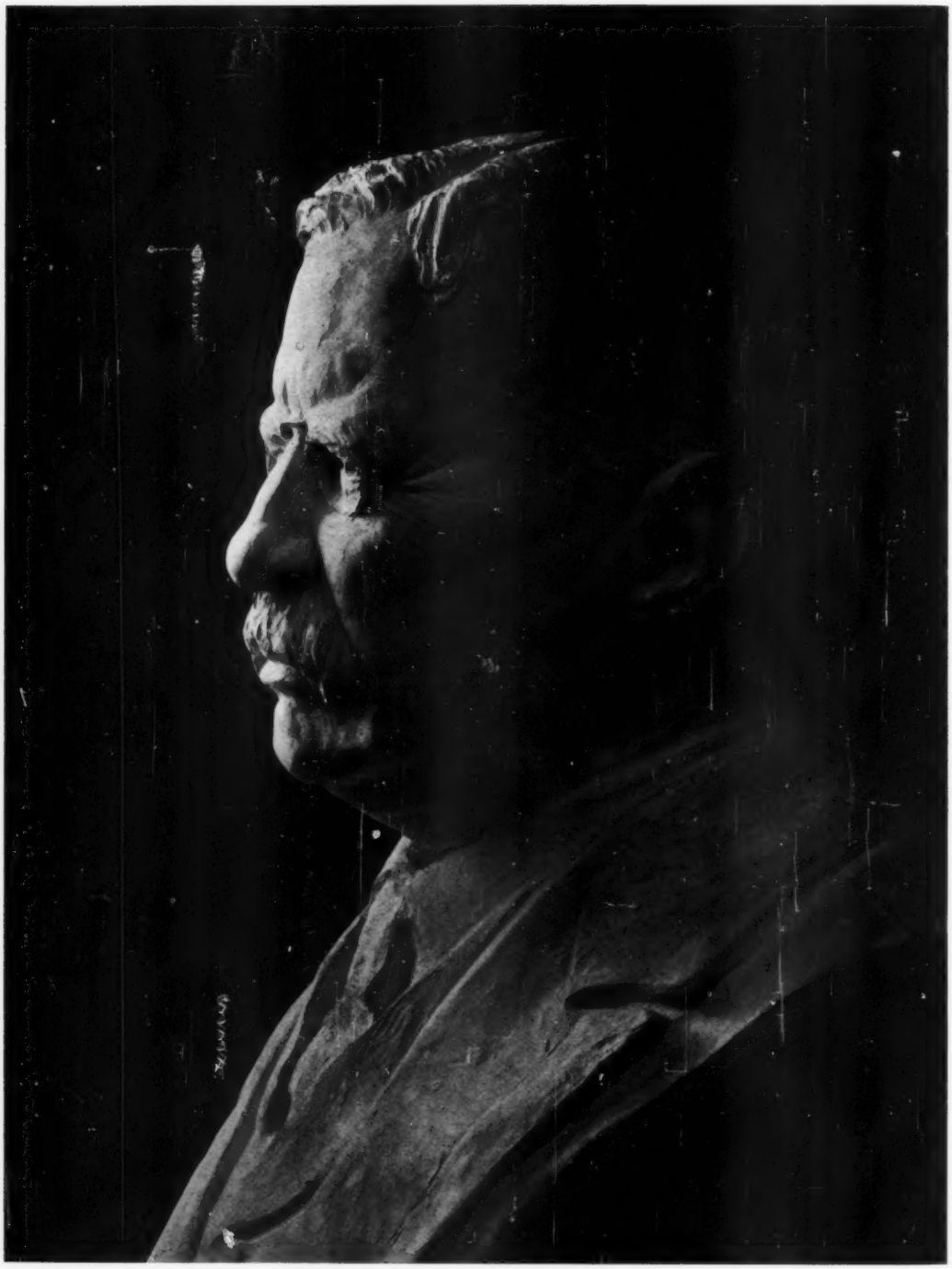


THE LAST BUST OF ROOSEVELT MODELED FROM LIFE

The work of Sigurd Neandross

Mr. Neandross aimed to make a faithful life portrait of the older Roosevelt. The work was executed from studies made at Mr. Roosevelt's New York office and at the American Museum of Natural History just before Roosevelt was taken to the hospital prior to his death, and the bust was never completed.

At the close of a new single-volume edition of Rudyard Kipling's verse, just from the press of Doubleday, Page & Company, are these lines on Roosevelt:

"Concerning brave Captains
Our age hath made known
For all men to honor,
One standeth alone,
Of whom o'er both oceans
Both peoples may say:
'Our realm is diminished
With Great-Heart away.'"

NATURAL HISTORY

VOLUME XIX DECEMBER, 1919 NUMBER 6

A Geographer at the Front and at the Peace Conference

By DOUGLAS W. JOHNSON

Professor of Physiography, Columbia University; lately Major, Military Intelligence Division, United States Army, and Chief of Division of Boundary Geography, American Commission to Negotiate Peace

From stenographic notes of an address delivered on the occasion of the annual dinner of the New York Academy of Sciences, December 15, 1919. Illustrations from photographs by the speaker

I HAD the opportunity, in connection with a coöperative undertaking by the American Geographical Society and the authorities of the United States Army, to visit the battle-fronts from Belgium to Saloniki during the military operations, for the purpose of studying on the ground the influence of the terrain upon military strategy and tactics. It will be possible in the few minutes this evening to pick out from my interesting experiences during that trip only a few examples of the very evident influence topography has on strategy, and then to show how we applied geographical knowledge not only of strategic matters, but also of other territorial questions, in solving the problems of the Peace Conference.

In northern France and Belgium we have a region of low plain, above which there are occasional low topographical eminences, which played a striking part in the military operations of the Great War. Farther southeast, in the area east of Paris, the land is made up of a series of plateaus, each having a general slope westward toward the Paris basin, and a somewhat ragged and steep escarpment overlooking a lower plain to the eastward. These steeper slopes face toward Germany, and have been called the natural defenses of Paris. It was no accident that the main German offensive came not from the east, across the low plains dominated by high escarpments, but instead from the north to take the natural defensive lines in the flank.[1]

I am going to describe a few typical areas in the northern plain, beginning at the Belgian coast and the Mt. Kemmel-Vimy Ridge area, where the topography had a very striking influence on the local fighting; then in the Verdun region and the St.-Mihiel salient; and finally in the vicinity of Nancy, where the topography was ably utilized by General de Castelnau in his magnificent defense of that city.

Turning first to the Belgian coast, we find that the battle-front ended literally not only at the sea, but in the sea, the barbed wire entanglements crossing the line of dunes which separates the lowland of Belgium from the sea and extending out into the water in order to prevent local flanking movements. In that lowland the surface over extensive areas is below the level

[1] For full explanation see *Topography and Strategy in the War* (pages 2–10). Henry Holt & Co. By Douglas W. Johnson.

of the sea at high tide. By opening the tide gates, it was possible to admit the waters of the sea at high tide and flood large tracts of land. This means of topographic defense was utilized, as you will remember, in the great battle for the Channel ports, and with such success that an inferior number of Allied troops were able to stop the great German drive in one of the big bids which Germany made for success in the war. On every railroad embankment or other slight elevation above the low-lying waste of waters it was possible to construct a series of sandbag protections to serve as lines of resistance against which the Germans always had to advance across submerged areas. The danger of these submerged areas lay not merely in the fact that maneuvers in the water were difficult and the footing very insecure and uncertain, and that concealed beneath the waters were deep ditches and trenches where a man might suddenly drop into depths far over his head, but also in the fact that in such a flooded region every wounded man is a dead man. When he falls from his wound, he falls not on the battlefield to be carried off to a hospital, but into the water to be drowned. Hence it was that the German losses in killed were unusually heavy in the battle for the Channel ports.

Some distance southeast of the Belgian coast and just northwest of Lille is a series of low hills rising only a few score of feet above the general level of the flat plain. Mt. Kemmel forms the easternmost member of these hills. When one of the German communiqués stated that their best mountain troops had been able to scale the heights of Mt. Kemmel, the world may have imagined that the climb was a difficult one. I think, however, that the most corpulent of individuals could easily reach the summit in a ten or fifteen minute walk from the base of the hill. Yet that slight elevation gives a perfect command of every road and of every obstacle capable of concealing a gun, over a broad stretch of country. From Mt. Kemmel it was possible on a clear day to see northwestward clear to the line of dunes at the sea; then to sweep the entire panorama of the battle-front north, east, and south, until it faded away on the horizon south of Vimy Ridge. It is not difficult to understand why there were such bitter struggles for so commanding a point of observation.

Southwest of Lille, and not far from the town of Arras, there rises above the plain a ridge which has a gentle southwestern slope and a steep northeast-facing escarpment. This is the famous Vimy Ridge. In the early days of the war the Germans made a point of seizing this ridge. I may say parenthetically that it was the testimony of officers all along the western front that the Germans showed unusual skill in selecting and seizing topographically favorable points, and that as a result the Allies were, at the beginning of the war, usually at a topographic disadvantage as compared with the enemy.

What was the peculiar value of Vimy Ridge that such a terrible price should be paid for its recapture by the Allied armies? It was a question of observation. So long as the Germans held the southwestern slope of the ridge they could see every movement within the Allied lines for a great distance north and south; whereas, the Allies themselves, facing up hill against the German lines, could see nothing but the obstacle of the rising ridge. The Germans could carry on their maneuvers on the plain behind the ridge unhampered by enemy observation except such as was possible by means of aëroplane and balloon. Continuous and easy observation direct from the ground has great advantages over the more uncer-

tain observation from the air, where the observer is subjected to great annoyance and danger if he flies low, and suffers from restricted vision if he flies high.

The Allies lost many tens of thousands of killed and still larger numbers in wounded, to gain a few hundred yards of this valuable terrain. It was worth the price, for with that gain the rôles of the two armies were reversed. The Germans were on the defensive, their back areas under perfect observation, and the possibility of their planning a surprise attack greatly reduced, while the Allies enjoyed the protection from direct terrestrial observation which the enemy formerly enjoyed. The path to victory was being prepared.[1]

Now let us pass far eastward to the region of Verdun. It is in the topography of this region that we find an explanation for the direction of the German attack, which was from the north down the valley of the Meuse, in spite of the fact that the east-west spurs, projecting into the winding valley, gave a series of positions very difficult to take. The high plateau escarpment facing eastward and overlooking the low plain of the Woëvre, was even more difficult, however, for the French troops on the plateau crest possessed a truly wonderful command of the whole low country to the east over which any German attack from this direction would be compelled to move. The plain of the Woëvre is dotted with marshes and ponds, roads are few, and are in full view of observers on the heights above. Artillery control of the relatively few approaches to the cliffs leading up to the plateau was so perfect that an attack from the east would offer even less chance of success than an advance down the valley.

During the battle of the St.-Mihiel salient, the American troops pressing north across the plain of the Woëvre were aided by troops sweeping down from the plateau on the west, and by observers posted on the plateau crest in order to observe and direct the progress of operations. The American troops occupied, at the beginning of the operations, a line running east and west across the low plain. Facing them were the Germans in a very strong position selected with such skill that, while the Americans on taking over this part of the French line found themselves down in the marshes and mud, the enemy stood high and dry on the projecting spur of the plateau forming Montsec and its adjoining ridge.

In the battle of Nancy the Germans did attempt the difficult task of attacking the face of a plateau scarp from the low plain to the east of it. The scarp in question lies next east of that near Verdun, and is known in part as the Grand Couronne. North of Nancy the scarp is high and forbidding, while to the south it appears less formidable.

The battle of Nancy was divided into three phases. The Germans, realizing the difficulty of scaling the heights north of Nancy, first marched their armies southward and attacked the escarpment where it was lowest. The attack failed because the French, even on the lower escarpment, had a command of the low plain in front which made it impossible for the Germans to attempt any movement of surprise, and which enabled the French artillery to decimate the attacking columns as they moved into position. The second attack was against the city of Nancy itself and that part of the plateau just north; but although the Germans were able to cross the plain toward Nancy

[1]The full significance of Vimy Ridge, and its place in the fighting of several campaigns, cannot be told in a few moments but will be fully described in a large monograph to be published by the American Geographical Society in 1920.

for a considerable distance, on twelve successive days they were beaten back by the artillery fire controlled from advantageous observation points. The final attempt was a drive southward from the direction of Metz, against a projection of the plateau at Ste.-Geneviève, with the hope of passing down the Moselle Valley to reach Nancy. After the attacking forces had succeeded in reaching the crest of the plateau at one point they were pushed back into the plain and held there for the remainder of the war.

These studies were carried on in part for the purpose of making the American Government acquainted with the importance and significance of strategic frontiers. We knew that when the Peace Conference convened certain countries were going to press extensive claims for strategic annexations of territory in order that they might have good, defensible frontiers; and we thought it advisable to know from observation under modern conditions of warfare just what was the value of topography in defensive and offensive warfare. It is interesting to record that the testimony of the officers with whom I talked, including both commanders-in-chief and generals of lesser rank all along the fronts from Belgium to the Balkans, was to the effect that topography not only affects the movements of military forces today as much as it did in the past, but that under modern conditions of warfare the control of topography is even more effective than ever before. As Marshal Haig expressed it, one would not be exaggerating to say that the entire war has been a struggle for topographic position.

It may perhaps interest you if I sketch for a moment the kind of organization we had at the Peace Conference, and tell where the geographic work came in.

The question of language interested many of us, particularly when we first saw the Peace Conference begin its operations. English and French were on an equal footing as the official languages of the conference, and the proceedings of the Supreme Council and of the Big Four were carried on in both. Only in some of the commissions where everyone spoke French, was French alone employed, in order to reduce by half the time required for such commissions to do their work. In the Supreme Council and other more important meetings the translating was done by the wonderful Mantoux, a man of high distinction as an authority on certain English economic problems, possessing perfect command of a number of different languages, and gifted with a most remarkable memory and a power of mimicry which enabled him to reproduce not alone the words but also the thought and spirit of those whose words he translated. Inasmuch as he is probably the one man who was present at most of the important meetings from the days of the Supreme War Council to the close of the Peace Conference, his memoirs, if ever published, should prove a valuable and fascinating document.

I shall never forget the first time I saw this remarkable man at work. It was at a meeting of the Supreme Council, and the representative of a smaller power was presenting his country's claim to certain territory. As the presentation proceeded, Mantoux, sitting to the right of and slightly behind Clémenceau, jotted down hasty notes on large sheets of paper lying on the small table before him. I waited, with growing surprise, the moment when the speaker would cease and allow the translation to begin. But five minutes, ten minutes passed, and still the speaker continued; and still Mantoux

calmly jotted down his notes. The door opened, a liveried porter slipped into the room, and laid a letter on Mantoux's table. Note taking ceased, Mantoux read the letter, wrote a reply, and handed it to the porter. All this time the delegate of the power in question continued the earnest argument in favor of his country's demands. What a shame, I thought, that the translator should be missing a vital part of that argument! And I made a mental note of the points which would escape the knowledge of those who did not understand the original presentation in French. Finally, after a lapse of time which seemed to me almost interminable, the speaker paused, and bowing to Mantoux, intimated that the first section of his address might now be rendered into English. A moment's hesitation, during which he glanced hastily over his several pages of notes as if to visualize the whole argument in its entirety, and Mantoux began. In clear tones and a forceful manner, the translator now reproduced with remarkable fidelity the thought, the phraseology, the very emphasis of the original speaker. Nothing was lacking, and while I breathlessly awaited the hiatus which should mark that portion of the address lost during his preoccupation, Mantoux calmly reproduced it all, not a sentence missing. His mind had recorded each word even while it seemed otherwise engaged, and now gave back in another tongue all it had received. Assuredly Mantoux was one of the outstanding figures of the Peace Conference.

With the Supreme Council and its general organization you are already familiar. Later, this Supreme Council (popularly called the Big Ten) broke up into the Big Four and the Big Five—the Big Four being Mr. Wilson, Signor Orlando, Mr. Lloyd George, and M. Clémenceau (the Japanese representative not participating actively where matters of the western world only were concerned), and the Big Five consisting of the Ministers of Foreign Affairs. Next below there came a series of commissions including the territorial commissions composed of two delegates from each of the four great western powers. There were such commissions to consider the territorial demands of Greece, Roumania, the Jugo-Slavs, the Czecho-Slovaks, and so on. The appropriate territorial commission would give a hearing to any small power which desired to present its case, or to two or more powers where there were conflicting claims to territory. After hearing both sides of the case, the members of these commissions and their associated geographical, economic, historical, military, and other experts would debate the issues at length, and decide what was just in each claim and what was unjust, and where the new boundary lines should be drawn, striving to fix the frontiers as nearly as possible along lines of racial division but taking into due account the geographic, the economic, and to some extent, the strategic factors, in order to get the wisest and most permanent settlement of the various complicated territorial problems. I think it is just to say that in most cases a sincere effort was made by the disinterested technical men of the different great powers to lay down the frontiers of Europe in the way which would be fairest to all concerned. And while political considerations sometimes influenced the representatives of this or that nation, and questions of politics or policy sometimes caused the recommendations of the experts to be set aside by the higher authority of the Supreme Council or the Big Four, nevertheless, the frontiers of the new Europe as you will see them on the map were, for the most part, drawn in the territorial com-

missions by disinterested geographic and other experts.

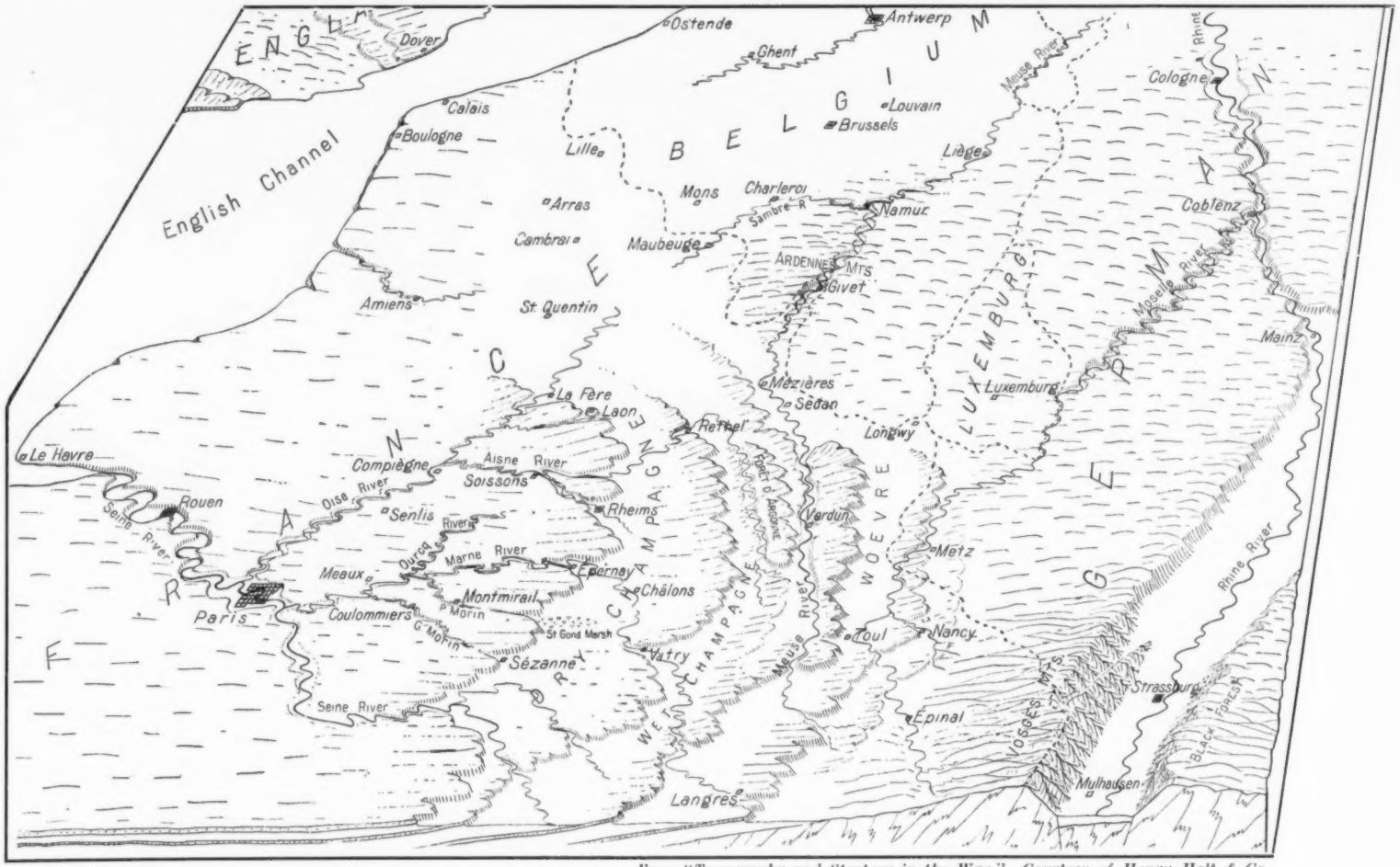
Now, the kind of problems which constantly came before the territorial commissions can best be illustrated by taking one which did not come before such a commission; for then I will reveal no commission secrets by referring to it. I will select a problem in which you are very much interested at the present time; namely, the Adriatic problem. We have here an issue which is fundamentally based on great questions of political, physical, economic, and strategic geography. It was the duty of the different geographic, economic, historical, and other experts to know all phases of this and other territorial problems: to say, for example, that the linguistic and racial boundary between the Jugo-Slavs and the Italians lay far over on the western edge of the Istrian peninsula, and that if a decision were made on the basis of nationality alone, not only Fiume but most of Istria would have to go to Jugoslavia. It was also for them to say that the natural or geographic frontier lay on the high mountain ridge forming the backbone of Istria and located close to its eastern shore; that all economic relations of the people west of that divide may lie most naturally with the Italian side of the mountain; and, hence, that it may be wisest to push the new international boundary away from the racial boundary and on up the western slope of the mountain until its crest is reached, in order to secure not only a good economic and a natural geographic frontier, but also a frontier that is strategically defensible. For all these reasons there may be very just grounds for giving to Italy a part of the territory she desires to annex, despite the fact that in so doing, a solid block of 370,000 Jugo-Slavs must be put under Italian rule against their very strong protests.

On the other hand, the geographer and economist must point out the fact that along the whole eastern coast of the Adriatic runs a high barren mountain belt, very little populated and across which at the present time there is not a single standard gauge railroad south of Fiume; that no commercial intercourse of great importance can ever take place across that barrier; that if one takes a map of the standard gauge railway system of the new Jugo-Slav nation he will find that it is almost entirely concentrated in the northern part of the country, and that its one and only natural outlet is the port of Fiume; and to point out that because of these peculiar conditions, any power which controls Fiume holds in the hollow of its hand the entire economic life of a nation. It is the duty of the higher political authorities to balance the claim of an isolated group of Italians constituting a minority of the total population of Fiume, against this claim to economic life of a whole nation, and against the further fact that if the frontier of Italy is brought far enough eastward to include the few Italians of Fiume, a vastly greater number of Jugo-Slavs must be sacrificed.

In conclusion I can assure you that the work of supplying such a variety of technical information on a large number of vitally important problems taxed to the utmost the capacities of the scientific advisors. If the work was exacting, it is a satisfaction to know that the advice of the territorial experts was frequently sought and extensively used, and that it played no inconsiderable rôle in establishing the new frontiers of Europe.

Mont Kemmel as seen from the plain at its base.—In the foreground is one of the muddy roads typical of the Flanders plain beside which are the ruins of a former village. Mont Kemmel is the easternmost of a number of low hills just northwest of Lille. From its summit could be obtained a panoramic view of the battle-front from the dunes of the Belgian coast on the north to the horizon south of Vimy Ridge near Arras. Accordingly, the army which possessed the hill held command over every road and gun position available to the enemy. It is easy to understand why such small eminences on the northern lowland were the centers for some of the most severe struggles of the war

The plateau scarp southeast of Verdun.—At the right is seen the plateau upland, its higher, steeper slopes wooded, while at the left is the low plain of the Woëvre, effectively dominated by the escarpment. This illustrates the nature of the scarps presented by the series of semi-circular plateaus which extend eastward from Paris. Artillery fire from these commanding heights could not successfully be faced, therefore the great attacks against Verdun were from the north down the valley of the Meuse. The east and west cross ridges of the Meuse gateway, however, proved equally effective obstacles. It was the natural topographic defenses of Verdun and not its modern fortifications that made possible its stubborn and successful defense



From "Topography and Strategy in the War." Courtesy of Henry Holt & Co.

PHYSIOGRAPHIC DIAGRAM OF THE WESTERN THEATER OF THE WORLD WAR.—The natural defenses of the Paris basin are a series of semicircular plateaus (with their escarpments facing Germany) and the outlying Vosges and Ardennes mountains. Across the plateaus several rivers run to the west, as the Aisne and the Marne, and provide a series of trenches opposing an attack from the north. There are two main directions of approach to Paris: one directly westward across the successive belts of plateau; the other, more circuitous, by way of the Belgian plain. The first was opposed by topographical obstacles so serious as to render a quick descent upon Paris impossible; hence, the longer but easier route through Belgium was chosen. On the extreme north is another natural defense in the Flanders coastal plain which is overflowed at high tide unless artificially protected and which assisted materially in the defense of the Channel ports. The important part played by these geographical features may be read in the names most frequently mentioned in dispatches: Liège and Mons at the beginning of the war; the Marne where the Germans were checked; and the towns which lie at the gateways in the line of escarpments, as La Fère, Rheims, Rethel, Verdun, Nancy, and Metz

sistcd materially in the defense of the Channel ports. The important part played by these geographical features may be read in the names now familiar, mentioned in dispatches: Liège and Mons at the beginning of the war; the Marne where the Germans were checked; and the towns which lie at the gateways in the line of escarpments, as La Fère, Rheims, Rethel, Verdun, Nancy, and Metz

BEYOND LIES GERMANY

Looking east from the plateau scarp south of Nancy, showing the effective observation control of roads over which the enemy had to approach the upland. Here the Germans attempted to attack the escarpment directly, but were successively beaten back by artillery fire which swept the open plain, breaking up their formations before they could move against the face of the plateau

AN OUTLOOK WHICH WAS BOUGHT AT A GREAT PRICE

View of the Flanders plain, looking northeast from the crest of Vimy Ridge.—The conical mounds are "slag heaps" from the coal mines lying under the plain; these played an important rôle in the fighting because of their value as observation points. The ridge commands the plains on both sides so that the army in possession could maneuver to advantage while fully anticipating all movements of the enemy. The Germans seized Vimy Ridge at the beginning of the war and it was recaptured by the Allies at great cost in the famous actions bearing its name

session could maneuver to advantage while fully anticipating all movements of the enemy
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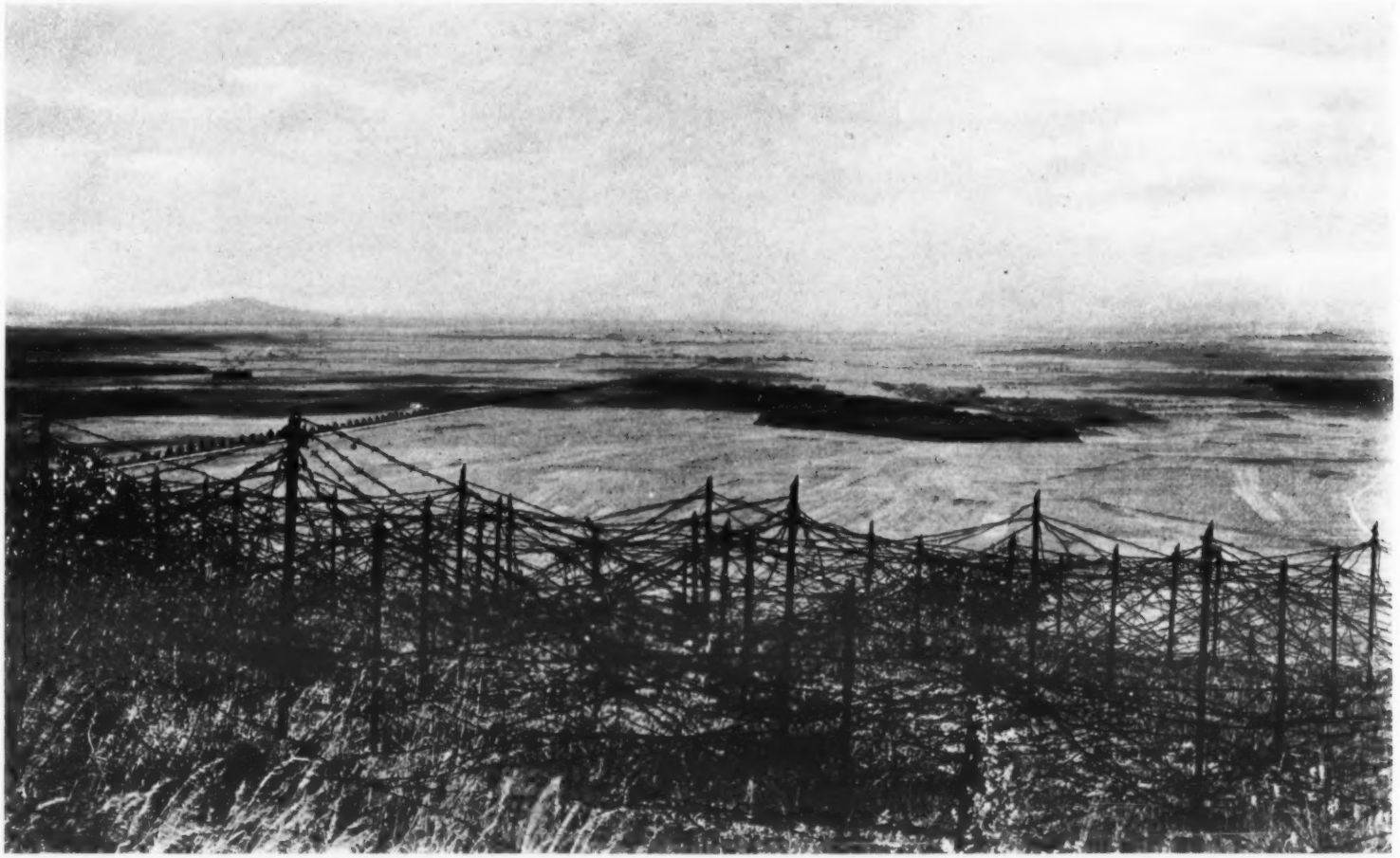
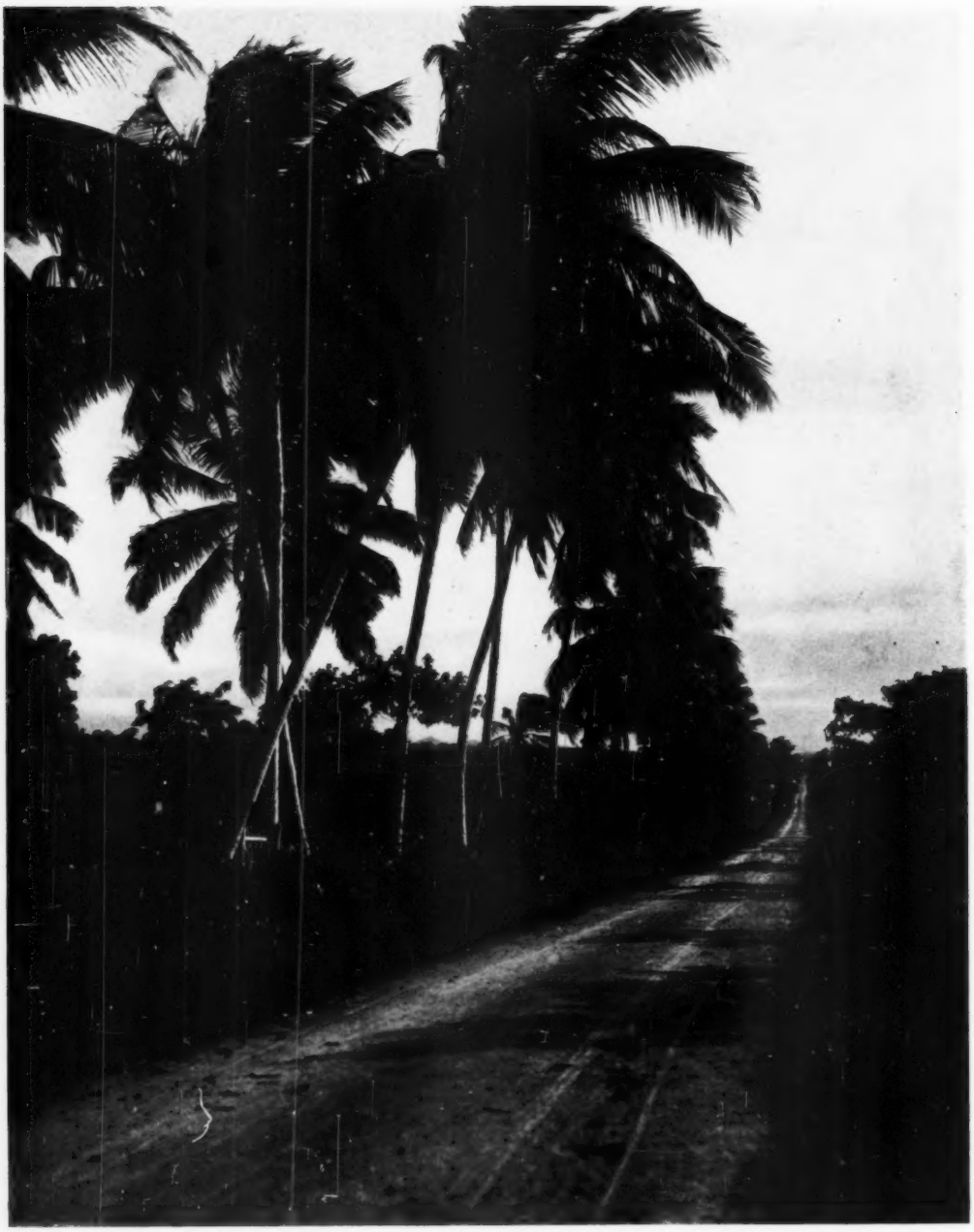


VIEW FROM THE EDGE OF ONE OF THE NATURAL DEFENSES OF PARIS

The flat plain of the Woëvre as seen from the dominating plateau to the west.—Montsec is visible in the left distance and the American line before the battle of St.-Mihiel crossed the plain just beyond the wooded areas in the middle distance. In advancing from this position, the Americans were aided by troops moving down from the plateau and by observers on the heights who were able to watch the progress of the attack



COCONUT PALMS, A STRAIGHT ROAD, AND A LEVEL COUNTRY

The first as common a sight in Porto Rico as the other two are uncommon. But this photograph is characteristic of the limestone plateau in the northwestern part of the island. Coconut palms are universal along the coasts of Porto Rico and may be readily distinguished from their upright relative, the royal palm, by a flexible appearance and a thinner trunk. Compare with the royal palms shown on page 531

The port of San Juan is the mooring place for sailing vessels which frequent the coast and ply to islands near by, notably to Saint Thomas. In the distance the even sky line of the upland (upper peneplane), broken by the notches of the Plata and Bayamon rivers, is easily seen. Nearer to the foreground are the fantastic limestone hills which border the coast

Five Land Features of Porto Rico: A Story of Cause and Effect

By A. K. LOBECK

Fellow of the New York Academy of Sciences

FOR the traveler in a new country, the conditions of travel and the comforts which await him in the places where he stops are often more important in molding his impressions than are the charms of the country itself. The traveler who sees Porto Rico from the magnificent automobile route between San Juan and Ponce will return with glowing memory of pictures of idyllic landscapes, rugged mountain grandeur, tumultuous waves on rocky coasts, broad plains of waving sugar cane, and far-away views over the sparkling Caribbean—with its wealth of exploits in the days of Spanish glory.

But the man who steps aside and goes over the native trails or stops in the smaller towns, although he may feel more the romance of his undertaking, will nevertheless, later, probably have his thoughts often tinged with the memory of the inconveniences and hardships to which he was subjected. This is true not only of Porto Rico, it would be the same anywhere. Most of the show places of America, our national parks, our places of scenic interest, are beautiful or otherwise to us according as we have seen them in comfort or misery. Porto Rico deserves to make herself hospitably comfortable for the tourist. She deserves a setting among these other gems of natural beauty. She deserves to be known in all her parts. The charm of her scenery, the variety of her features, and the peculiarities of her people place her in a novel position as a retreat for American nature lovers. She can add a distinctly new set of interests to those already known in our national parks and monuments.

Look at Porto Rico from the tourist's standpoint. What does she have and what does she lack? She has an unexcelled system of automobile roads encircling the island and crossing it in several places. But she has only two cities, San Juan and Ponce, which provide that degree of comfort to

which the traveler is accustomed. The ninety-mile ride—a five-hour trip overland from San Juan to Ponce—a comfortable night at the Hotel Melia, and the return next day is the usual itinerary of the tourist. It leaves with him a delightful panorama of things tropical and a good idea of Porto Rican geography. No other towns in the island provide comfortable hotels. At some places like Arecibo, Manati, Mayaguez, and Yauco, the little hotels are reasonably good, but they would never leave a satisfactory impression upon the traveler. Now, what parts of Porto Rico are most worth seeing, what parts will most repay the efforts of visiting, what parts can we look forward to as most likely to have, some day, the facilities to attract and entertain the tourist bent on study or adventure?

First of all there is the Luquillo National Forest with its virgin timber, open and parklike, its quiet trails, its streams and bold cataracts. From Mameyes to Naguabo is a two-days' tramp through the mountains, a journey of supreme interest, but at neither end of it are there any real comforts to be found. So the only visitors to this garden spot are the occasional men of science who come prepared for what they find. Some day it will have its little chalets, not very elaborate but at least provided with American beds and facilities for preparing meals.

A distinctly different type of country is the bold haystack hill region between Lares and the north coast. Deep sink holes without outlets, streams plunging underground to follow their subterranean channels for many miles, sharp and picturesque limestone cliffs and pinnacles, overgrown with a tangled network of vines and tropical plants, are easily seen by trail; but here again the traveler must be willing to accept the hotel accommodations as he finds them and to put up with annoyances which few are willing to endure.

Of even greater interest and still more venturesome is the trip to Mona Island, fifty miles to the west of Porto Rico. The trip is made by sailboat from Mayaguez in less than twenty-four hours, but Mona Island is a wild place with only a lighthouse and occasionally a little colony of workers who come to extract the guano from the caves. On this little plateau, facing the sea in bold cliffs on all sides, one may see how forbidding nature can be and yet subtly lure one on in quest of strange sights. The jagged limestone surface, devoid of water and covered with a thick growth of cactus, is thoroughly inhospitable, but there is no reason why some day a little boulevard trail may not be cut through it and a place constructed to accommodate visitors whose tastes carry them to the unusual and unique places of the earth.

A fourth region of exceptional attractiveness in Porto Rico is the stretch of the northwest coast in the vicinity of Isabela and Camuy. The bold cliffs, the high sand dunes, the peculiar platforms and reefs at the water's edge, and the incessant activity of the waves make this place one of sustained interest and life. The waves that roll in upon the coast are sometimes ten feet or more in height under the impulse of the steady northeast trade winds.

These, then, are some of the attractions of Porto Rico, so different from those of our homeland, and so accessible that we can confidently look forward to the time when they will be made more hospitable to the stranger.

If a certain degree of comfort makes more profitable the time spent in visiting and studying a country, so also does a slight previous knowledge of the meaning of the things seen. Landscape is not unlike music, it is not unlike a written composition, it is not unlike anything else which is organ-

Morro Castle and the entrance to San Juan Harbor.—The reefs in the foreground owe their stepped character to the precipitating action of the sea water

The city of Guayama is one of the largest towns on the south side of the island. Broad alluvial plains covered with sugar cane front the Caribbean in the distance. Here is located the irrigation service of the United States Government. While the northern side of the island is abundantly provided with water, the southern side is deficient in rainfall. It consequently draws a large supply for irrigation by means of deep tunnels from the northern side of the watershed where large collecting reservoirs have been built

The trees show the effect of the incessant heavy trade winds which blow against the north coast of Porto Rico. Along a roadway near San Juan not only have the branches been forced to grow in one direction but the trunks as well show a marked inclination away from the wind

A forest of cactus.—The surface of Mona Island, several square miles in area, is densely covered with vegetation of this character. Herds of wild goats, pigs, and cattle, escaped from domestication, roam over it and eke out a difficult living. The animals have taken on characteristics in keeping with the harsh conditions of life to which they are now subjected. For instance, the pigs have apparently reverted to a type of boar with prominent tusks two or three inches long

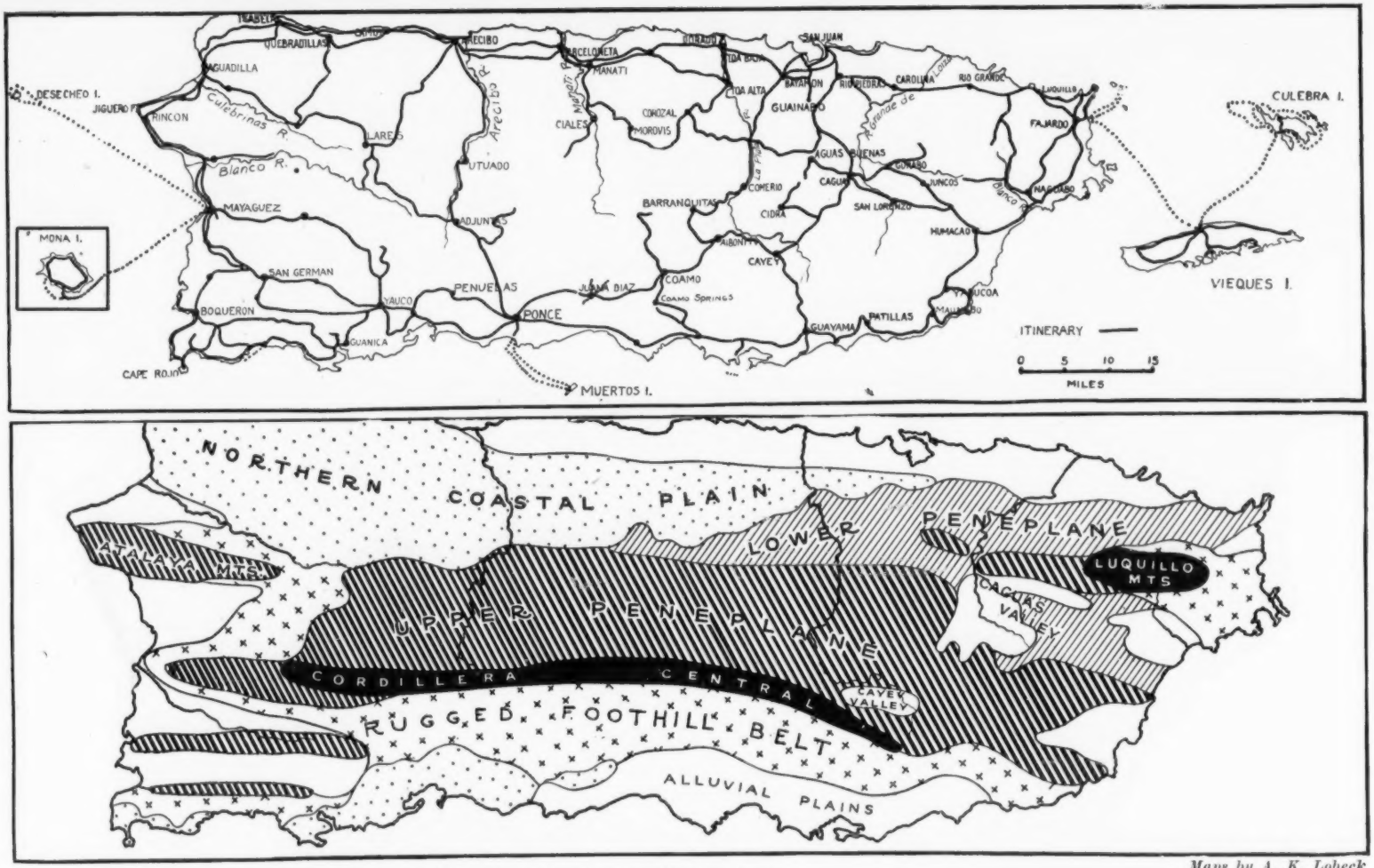
ized. The various parts may give pleasure in themselves. Indeed, ordinarily, we enjoy hill, valley, stream, cliff, plain, and beach each on its own merits without regard to the fact that they are all only parts of an organized whole and that they are all interrelated. Some people profess to enjoy music better if they do not understand the secret which underlies the composition of its parts. They would rather listen to it in a dreamy and languid way. There may be some people, too, who would rather enjoy scenery in the same way. But observations upon the usual traveler will show him quite eager to know how the features of the earth came to be as they are. Such a knowledge not only awakens in him a much deeper love for the things that he sees, but also this same knowledge helps him to remember these things because it introduces a logical and coherent relationship among them.

Five different types of land forms make up Porto Rico. Of course, land forms, like everything else in nature, exist in almost infinite variety, but if we confine ourselves to the five most important types, we can obtain a thoroughly satisfactory picture of the island and have a framework upon which to add any other types we may discover.

As we approach Porto Rico by boat from the north we are impressed by the remarkably even sky line over the central part of the island, interrupted only by the notches of the Plata and Bayamon rivers. When we travel into the interior, as on the route between San Juan and Ponce, we find that part of the course lies upon this rolling upland surface. The streams flow in deep gorges below this upland level and when the road runs along the bottom of the valley or along the side of the gorge the aspect of the country on all sides is rugged and mountainous, and not until we have climbed out of the valley on to the upland, about two thousand feet above sea level, do we realize how level-topped it is. And if investigation is made as to the attitude of the rocks in the road cuts, it is found that this level surface is so not because the rocks lie in level beds, for they are intensely folded and the upland surface apparently "planes" across the beds indiscriminately. Geologists have come to the conclusion that a surface like this which planes across the structure represents an old worn-down land surface, a surface worn down during many ages of time to sea level and then later bodily uplifted to its present height. It is because of this later uplift that the rivers have had their activity much renewed, and in consequence have cut deep gorges or cañons below the upland surface.

Examples like this are rather common, too, one of the best known being the upland of southern New England, standing in Massachusetts about one thousand feet above sea level and, like Porto Rico, having deep gorges cut below its surface. The name "peneplane" has been assigned to such a land surface, a term which means "almost a plane," although it must be noted that most uplifted peneplanes are very rugged regions for they have been much dissected by streams and only the even sky line beveling their complex structure reveals their true identity. This, then, is the explanation of the upland of Porto Rico, the central rugged portion, mountainous in aspect when viewed from below but even-topped when viewed from a distance or from a knoll upon its surface. This is the first of the five important types of land forms in Porto Rico.

A second type is exemplified in the two mountain masses, the Luquillo Mountains and the Cordillera Central. They stand as groups of peaks above the upland surface. Their present height is ascribed to the fact that they are made up of harder or more resis-



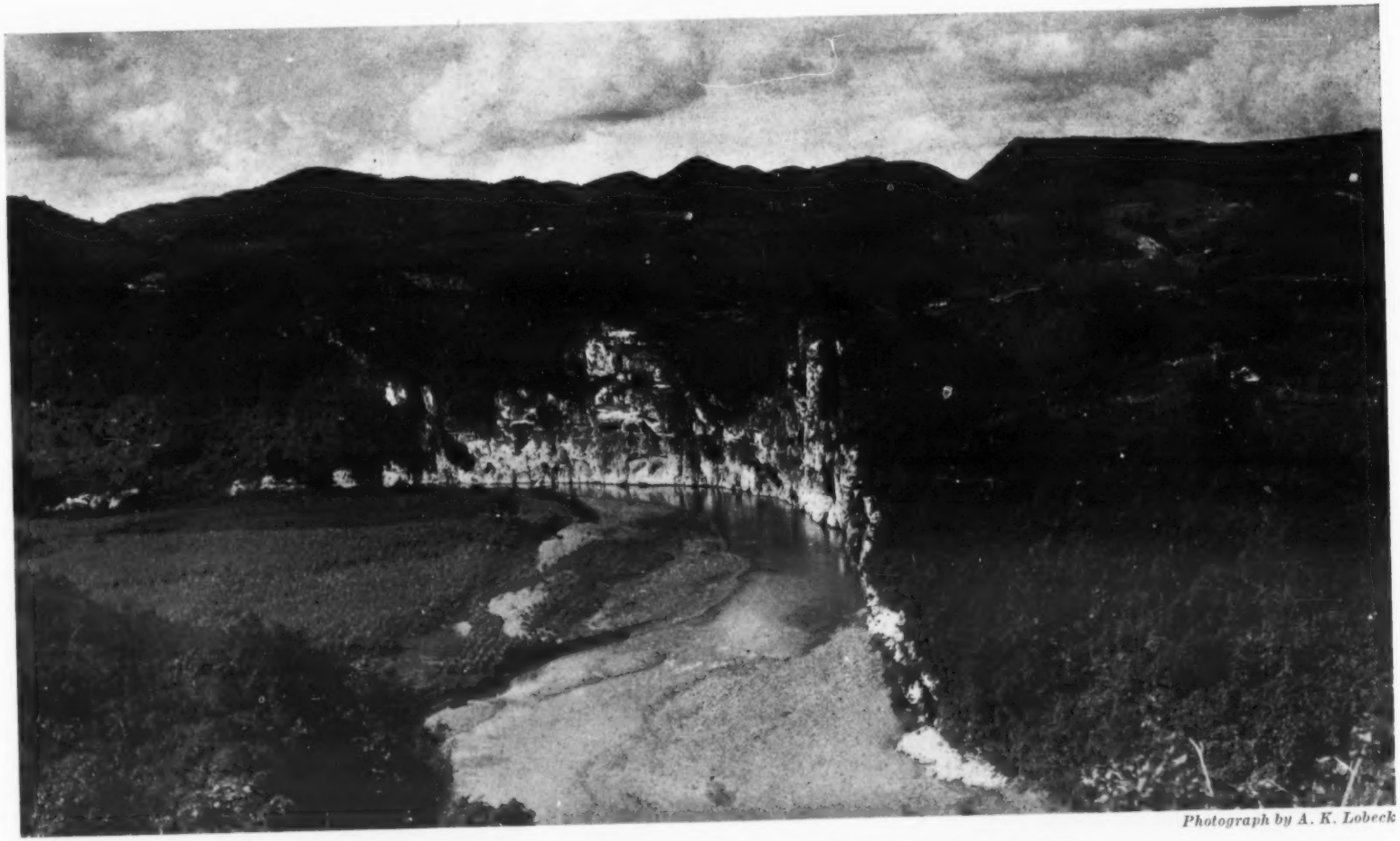
Maps by A. K. Lobeck

Above—Sketch map of Porto Rico showing the chief routes of travel and most of the towns

Below—Chart to show the five physiographic regions of Porto Rico:

1—The upper peneplane or upland which covers all the central part of the island. 2—The two mountain masses, the Luquillo Mountains and the Cordillera Central, which rise above the upland surface; with these may be included the rugged foothill belt which is simply the more dissected parts of the upland. 3—The lower peneplane forming a rolling platform along the north side of the island about a thousand feet below the level of the upland. 4—The limestone plateaus and hills forming the extensive northern coastal plain and the irregular patches on the south coast. 5—The alluvial plains, extensive flat areas along the coasts

northern coastal plain and the irregular patches on the south coast. 5—The alluvial plains, extensive flat areas along the coasts



Photograph by A. K. Lobeck

A GORGE THROUGH THE LIMESTONE PLATEAU OF THE NORTH COAST

The Manati River is not only cutting down into the limestone but is also widening out its valley by eroding the walls. In many parts of its course tributary streams which have been flowing underground beneath the plateau emerge from the sides of the little cañon and cascade into the main stream

A COFFEE "HACIENDA"

On this coffee plantation near the top of the upland the owner lives surrounded on all sides by the huts of his peons or laborers. The royal palm is a common tree in the vegetation of the upland, as the coconut palm is of the coastal regions. The intricate character of the stream dissection and the almost infinite number of small steep-sided valleys necessitate very winding and roundabout trails, almost precluding the building of satisfactory roads except at great expense

ROYAL PALMS WITH TRUNKS LIKE CLASSICAL COLUMNS

These stately trees are common in the interior of the island. Their heavy trunks bow outward in the middle and taper upward (compare with page 522). In the distance appear the haystack hills at the edge of the limestone country. The smaller trees and shrubs in the foreground are wild oranges which are very common throughout the western part of the upland and in much of the limestone country. Millions of oranges go to waste because of the difficulty of transporting them to the railroad or to towns for shipment. Going by trail through the country, one depends upon these as quenchers of thirst and it is no unusual thing to stop and "drink" twenty-five

Photograph by A. K. Lobeck

In the background rugged haystack hills form the margin of the limestone country. In the foreground the underlying formations, mainly volcanic tuffs and shales, give rise to a more flowing topography, often thickly covered with trees. The forests, however, are not a virgin stand, but are planted to serve as a screen to the coffee plants beneath. Thus, throughout the central upland much of the region that is apparently wild forest is actually planted in coffee and does not at first give to the visitor a true conception of the thorough use that is actually made of it

tant rocks which were not worn all the way down to the level of the upland when the peneplane was formed. These mountains are "residuals" or "monadnocks," a name derived from Mount Monadnock in southern New England, the type example of such a form.

The third distinctive land feature occurs as a rolling lowland belt ten miles or so in width along the north side of the island, and separated from the upland level on the south by an abrupt and rugged escarpment a thousand feet or more in height. In origin it is similar to the higher upland—that is, it represents a land surface worn down during long ages of time so as ultimately to form a rolling country. It also is a "peneplane," and may be called the lower peneplane. It was formed during the period following the uplift of the higher peneplane. Presumably much of the rock was worn away by streams, but it is also conceivable that the pounding of the waves against the north side of the island eventually cut this platform to sea level and that its present elevation is due to a later uplift.

A fourth land feature of Porto Rico introduces a new idea—and new rocks. Whereas the rocks underlying all the upland peneplane and the lower peneplane as well as the two mountain masses are of a complex nature, sometimes very much folded, oftentimes quite resistant and apparently of great age, the rocks making up the limestone plateaus and hills on the north and south sides of the island are in reality quite soft, and they lie in almost horizontal beds. And moreover, they are abundantly filled with the remains of marine organisms, corals especially, oyster shells a foot long, sharks' teeth, and parts of crabs and sea urchins. These beds represent accumulations of limestone and chalk, deposited under the sea upon the flanks of the much

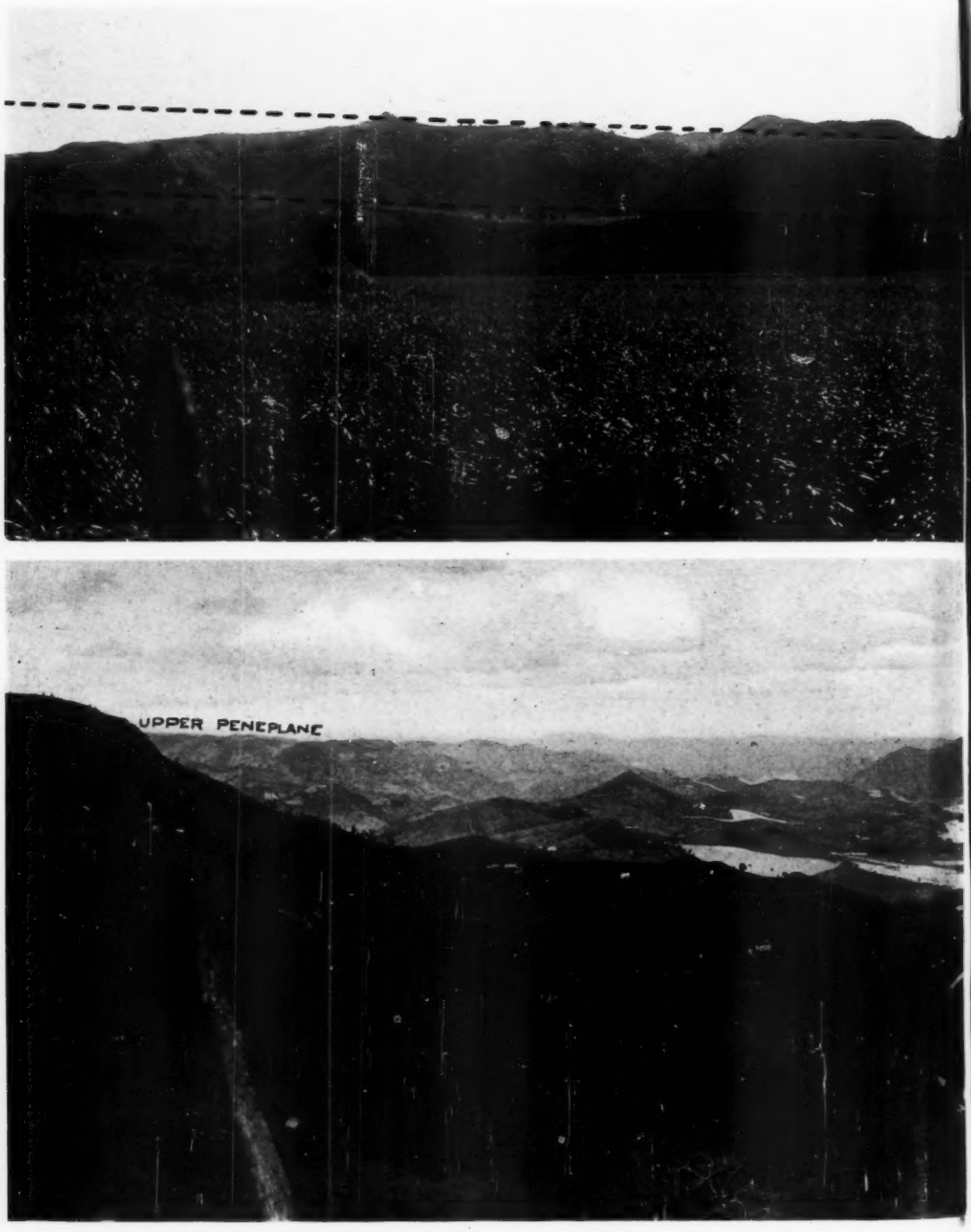
older land region, and later the uplift of the old land has brought these newer deposits far above sea level. As a result of this exposure to the rain and to streams the original smooth surface has been worn down irregularly in many places to form fantastic hills known as "haystacks." Elsewhere, because of the solvent nature of the limestone, these streams have dissolved out underground courses, a condition which is true of parts of Camuy and Tanama rivers where they flow beneath the limestone plateau between Lares and Arecibo.

Finally, there are extensive flat tracts of bottom land, or "playas," which fringe much of the coast and extend inland along the rivers sometimes for many miles. These alluvial plains represent deposits of fine material carried down by the streams and spread out along the coast either as deltas or alluvial fans as on the south side of the island where the water is quiet, or as a filling of the shallow bays which deeply indent the coast on the east and west ends. The seaward margin of these plains is formed by beautiful curving beaches of white sand which swing like arcs between the promontories on each side, sometimes for a stretch of two or three miles. With their groves of waving coconut palms silhouetted against the ocean and the sky, they add just that touch of picturesqueness which gives so much charm to the coasts of Porto Rico.

With these five types of relief features in mind, the central upland, the mountains rising above it, the lower rolling platform on the north side, the limestone plateaus, and hills, and the flat playa lands, it is comparatively easy to see the different parts of Porto Rico, even in their diversity, as elements of a larger unit. It is possible also to add many new and smaller features, placing them in some definite relation to these five important ones already known. Similarly other obser-

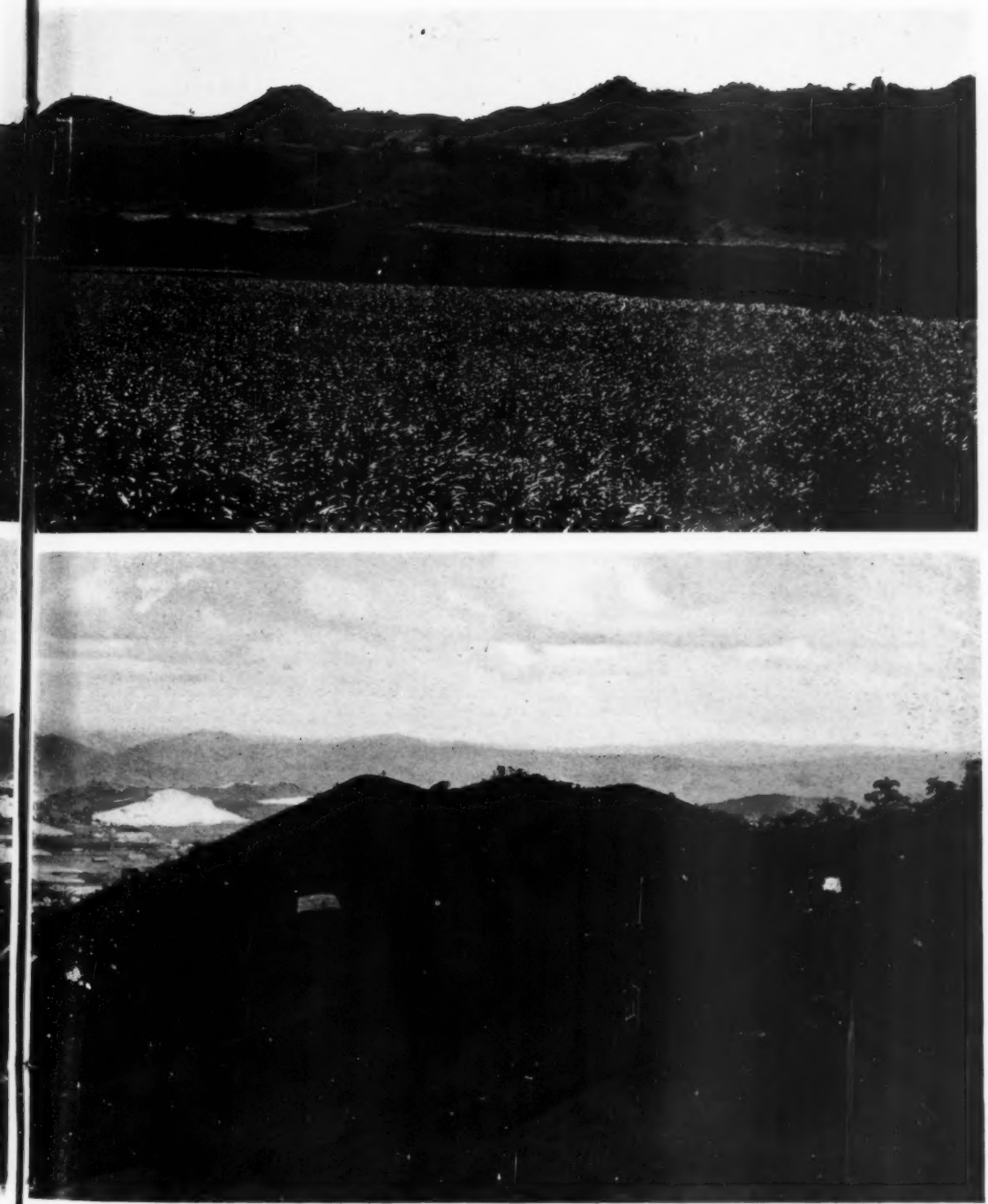
Photograph by A. K. Lobeck

These miniature erosion forms show characteristics which are found in the larger features of Porto Rico, intricate systems of branching valleys, sharp *cuchillo* or knife-edge ridges, and very steep slopes, sometimes almost vertical. The barefoot boy with his brace of fish provides scale for the picture



DIPPING BEDS IN THE LIMESTONE COUNTRY (UPPER PHOTOGRAPH)

The limestone region on the north side of the island of Porto Rico, known technically as the coastal plain, is made up of beds of limestone altogether several hundred feet in thickness, sloping gently northward toward the sea. This view provides a transverse or cross section of the beds in the valley of the Manati River and shows small sloping terraces in the valley sides formed by differential erosion or the wearing away of the less resistant layers



Photographs by A. K. Lobeck

CAYEY VALLEY, PORTO RICO, A LOCAL LOWLAND IN THE UPLAND (LOWER PICTURE)

The even sky line of the upland forms the entire horizon of the picture. Around the town of Cayey, which lies in the center of the lowland, are numerous plantations of tobacco, this being the most important tobacco district of Porto Rico. The white patches are not snow, or water, but tobacco fields covered with cheesecloth

Photograph by A. K. Lobeck

So-called tidal deltas are formed when the ocean waves break upon the beach to such a height that they pour over the narrow bar into the adjoining lagoon. The sand that is carried over is deposited in the fan-shaped mass which is a miniature delta, but oddly enough it is formed not by a stream entering the ocean but by the ocean entering the stream

Photograph by A. K. Lobeck

Sand dunes along the beach west of Arecibo.—Where the sand is kept moist by the spray from the waves it has become quite compact and solid through the deposition of lime in its interstices. All stages may be noted from loose sand on the landward side of the dunes to a hard coating over the seaward side, and finally to consolidated rock at the water's edge where the waves are continually breaking. Even the flat beach is hard and firm like a pavement, except where loose sand has just drifted upon it

vations such as those upon the location of towns, the agricultural pursuits of the people, the character of the vegetation, may best be made with the topography as a background. For instance, we may note certain geographical facts with regard to each one of these topographical areas.

On the rolling lower peneplane, because of the greater ease of movement and because of the proximity to shipping ports, fruit raising and the growing of some sugar cane are practised.

The limestone regions of the north and south sides of the island, both the

Photograph by A. K. Lobeck

Rugged cliffs mark the limit of the limestone plateau against which the waves of the Atlantic pound incessantly. After each rush of the waves the retreating water pours out of the hollows and irregularities of the rock and, by depositing a thin film of lime around the edge, gradually develops a series of terraces like those of the Mammoth Hot Springs, and for a similar reason. At first they suggest a wave-cut platform uplifted a few feet, but the random disposition of the small terraces and the presence of a thick pinkish deposit of lime around the margin of the pockets indicate their true origin

Because of its elevation and its rugged character the central upland is not densely populated and has practically no large towns. Coffee growing is the chief industry there because it requires almost no culture, and because the crop is of small bulk and is easily transported over the rough trails.

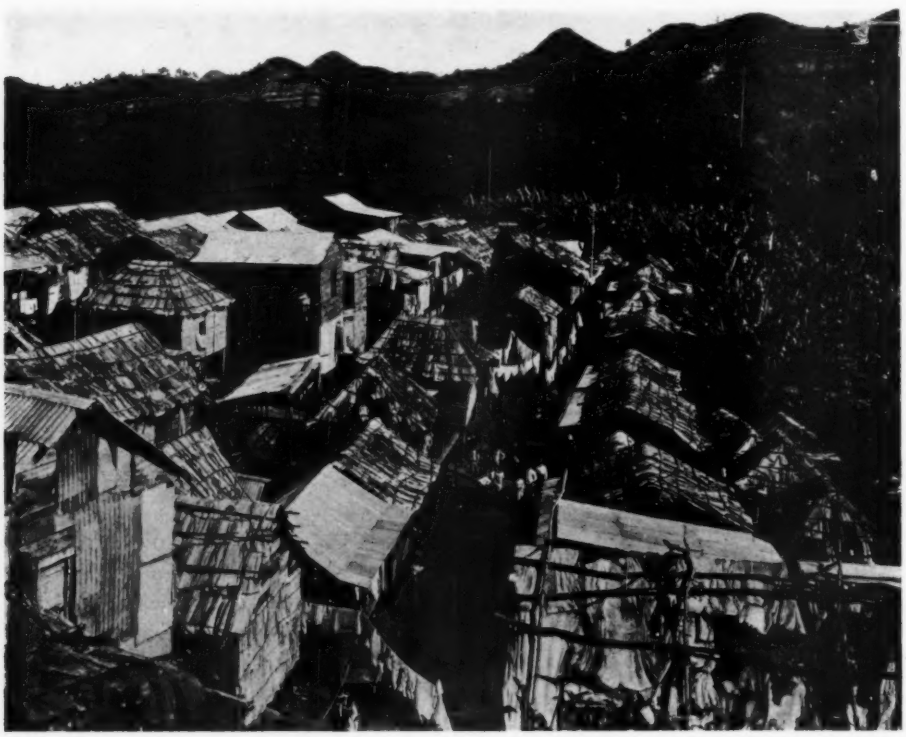
In the higher mountains the extreme ruggedness and the numerous rock exposures preclude practically all agricultural pursuits.

flat plateaus and the dissected haystack hill areas, are usually too dry and barren, because of the subterranean drainage, to permit the raising of large crops. Locally among the haystack hills there are flat spaces developed upon the more clayey beds of the limestone. The soil is excellent for fruit raising and is easily cultivated. For this reason not a little of the north coast region between San Juan and Manati is given over to the cultivation of

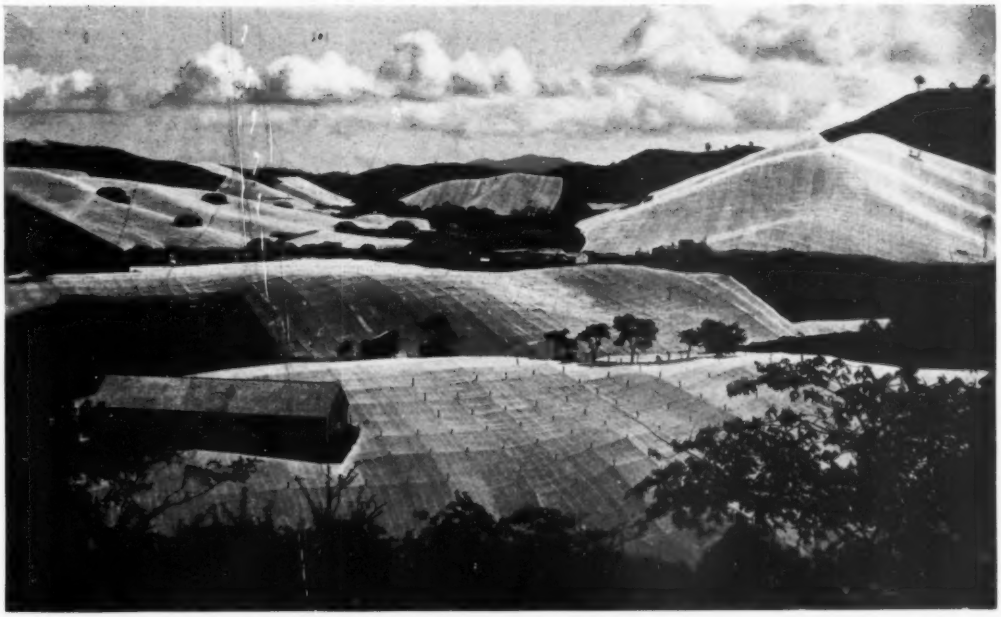
citrus fruits and pineapples. Many of the Americans who have made Porto Rico their home are engaged in this work.

By far the most valuable lands of Porto Rico are the great alluvial plains or playas. The word "playa" really means "shore," but in Porto Rico it is used to designate the whole expanse of flat land bordering the rivers along their lower courses. Here are the sugar cane lands. Extremely rich, extensive in area, easily cultivated, well watered, readily served with roads and small railroads, close to the shipping centers along the coast, they have the ideal combination of desirable attributes which have caused the sugar crop of Porto Rico to be worth each year three times the total of all her other exports—made up chiefly of coffee, fruits, and tobacco. Each of the great playa lands is a unit in itself. Separated more or less from its neighbors by the hilly promontories which extend down from the uplands to the sea, it seems like a little world of its own. The chief town lies in its center. Here is located the sugar mill or "central," to which all of the cane of the neighborhood is brought for grinding. The towns of Humacao, Maunabo, Yabucoa, Fajardo, and Naguabo near the east coast, are especially representative in this respect.

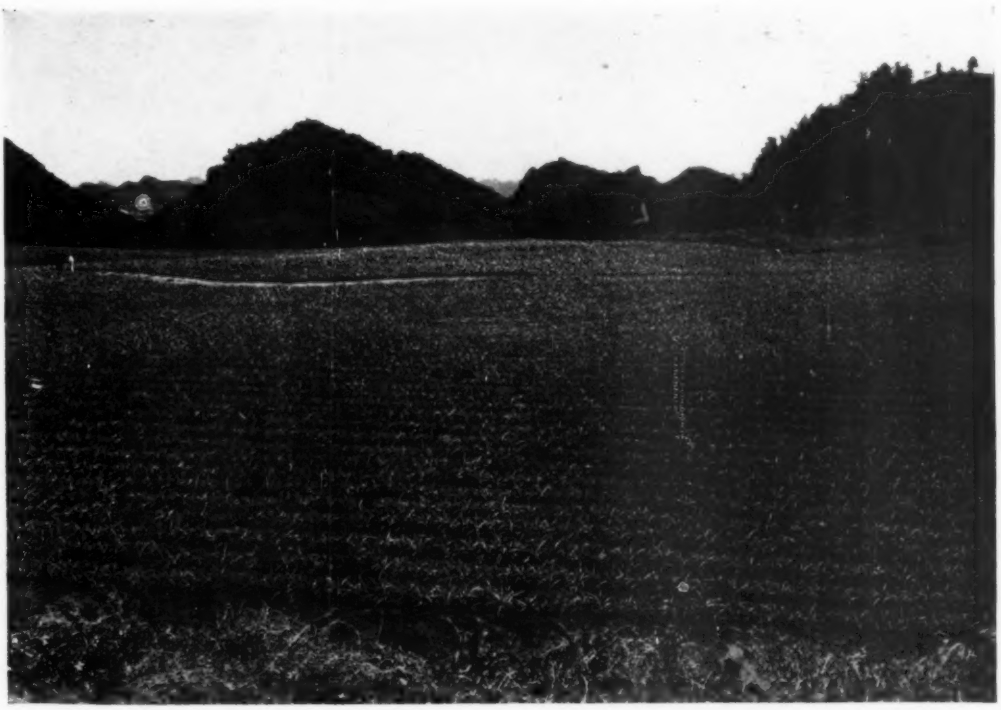
Intimately related with the topography, too, is the interesting climate of the country. In a small area Porto Rico offers some striking contrasts. Lying as it does within the tropics



The native huts in Lares are typical of the whole island. They are usually roofed with the flat pliable bark of the banana tree of which a grove is seen in the right of the picture. It is becoming common, however, especially among the more pretentious individuals, to use corrugated zinc or sheet iron, which, however, is not so picturesque, but is more durable and somewhat more satisfactory during the moments of a torrential downpour. The general use of the automobile in Porto Rico with the introduction of the common square five-gallon tin containers for gasoline has solved many a native's problem for weatherboarding, but unfortunately a building sheathed in this convenient material does not appear in this view



Growing tobacco under cheesecloth produces leaves of finer and thinner texture more suitable for cigar wrappers than those grown in the open, and the leaves are also much freer from holes, as the cheesecloth keeps out many biting insects. The cloth is stretched over poles and wire about ten feet above the ground. Such plantings are extensive and are followed mostly by large companies, the small planter being unable to invest in the enormous supply of cloth necessary



A pineapple field in the limestone country of the north coast.—The haystack hills resulting from the wearing down of the original limestone plateau are characteristic of the region. Between the "haystacks" there are occasionally sink holes or depressions without outlets. Elsewhere there are broad flat areas opened out upon a more clayey layer in the horizontally bedded limestone. These flat areas provide the principal fruit-raising lands of Porto Rico

and directly under the belt of trade winds which blow from the northeast, it is subject to their influence which is expressed in opposite ways. Trade winds are recognized as producers of desert conditions. Most of the deserts of the world lie in trade-wind zones. Around Porto Rico the islands which are not of sufficient size or height to induce precipitation are very dry and support abundant growths of cactus. This is especially true of the small islands Culebra, Desecheo, and Mona. Even on Porto Rico, the northeast tip of the island has a similar aspect because of the drying influence of the trade winds. But when these winds, with the great quantity of moisture which they have accumulated, are forced to rise over the mountainous interior of Porto Rico, their capacity for retaining moisture is diminished and excessively heavy downpours result. From out of the brilliant sky dense cloud masses form with great rapidity over the uplands and throughout most of the year several downpours may be expected every day. But when the winds reach the lower lands of the southern coast they not only have lost a large part of their moisture, but also in their downward journey they have been transformed into drying winds again, with the result that this whole coastal area is almost barren and parts of it experience months and even years without rainfall. Therefore irrigation is essential for the cultivation of large crops, and in the southwestern corner of the island where there occur the longest periods of drought, considerable areas are densely covered with cactus.

The torrential character of the rainfall over the uplands is a significant factor in the development of the sharp *cuchillo,* or knife-edge divides, common in the interior. Because of their very steep slopes, often of twenty-five to thirty degrees, and even of forty to forty-five degrees, the valley walls are pronounced barriers to progress. The average annual rainfall over the uplands is between 80 and 90 inches, or more than twice that of the vicinity of New York. Unlike the precipitation of middle latitudes, where the duration is to be measured in hours and even days and the amount in hundredths or tenths of an inch, the average duration of a shower in Porto Rico is ten or twelve minutes. There are numerous instances of successive showers which totaled 10 inches rainfall in twelve hours, while amounts of from 4 to 5 inches in twenty-four hours are of frequent occurrence. A record of 23 inches for twenty-four hours, as an example of an extended period of heavy precipitation, and of 1 inch in nine minutes for a short period, may suggest that important consequences must result from the accumulation and run-off of so great a volume of water in so brief a period of time.

An interesting phase of the situation is the impervious character of the soil throughout the "oldland portion" of Porto Rico—that is, the region made up of the volcanic rocks. The soil which develops from the decay of these rocks is a red clay or mud, excessively unctuous and tenacious, and exasperatingly slippery. It acts as an impervious mantle which prevents the penetration of water into the ground, thus causing it either to accumulate in all of the little pockets and irregularities of the surface, or immediately to run off and flood the streams. The exceedingly rapid run-off may be appreciated from the fact that many streams immediately rise 15 to 20 feet after heavy showers. In one case, the Plata River, twenty-five minutes after it began to rise, poured over the dam near Comerio in a sheet 15 feet or more in thickness throughout the entire length of the dam, about 575 feet, the flood continuing all day at 10 feet above the dam.

"Theodore Roosevelt's Letters to His Children" [1]

By HERMANN HAGEDORN

Poet and Playwright; Author of *Boys' Life of Theodore Roosevelt;* Secretary of the Roosevelt Memorial Association

TO those who were privileged to know Theodore Roosevelt in his intimate relationships, the cries of mingled delight and astonishment that have greeted the volume of letters which he wrote to his children, have themselves brought a shock of surprise.

"How perfectly extraordinary," exclaims Tom to Dick and Harry, "these letters are tender!"

"Amazing," cries Dick, "he was a real father, a wonderful father! In the midst of that noisy, busy life of his, he actually had time every day for his children."

And Harry gasps helplessly, "Who would ever have imagined it!"

All of which goes to show that the most discussed man of his time, the man who filled more newspaper columns and more magazine pages and more books than any dozen of his contemporaries put together was actually unknown to the millions whose hero and idol he was. They thought of him in terms of the Big Stick of the swashbuckler of the cartoons, the Apostle of Strenuosity, the Man-eating Lion, the Thunder-god before whose word parties died and parties came to birth—that was Roosevelt to them. One wonders in bewilderment what these millions imagined concerning him in his capacity of husband and father. A tyrant unquestionably they thought him, domineering over his family, thundering laws from Sinai, stamping through the house like an elephant trumpeting down the slopes of Kenia. One wonders what these folks with their established notion of what "T. R." ought to be, would have said if they could have seen him on a certain summer's day during the last year of his life.

It was at Sagamore. The day was warm and the youngest grandchild was lying in her crib in a shaded corner of the porch, dreamily content. Around the corner from the *porte-cochère* came the Colonel, espied the baby, and with a chuckle of delight lifted her out of the crib and hugged her, making absurd, joyous noises.

Suddenly at his back he heard a soft, familiar voice. "Now, Theodore," protested Mrs. Roosevelt, "do you know what you've done? That baby was perfectly happy there. Now someone will have to hold her the rest of the afternoon."

"All *right,*" cried the Colonel. "I'll hold her!"

And hold her he did, rocking back and forth in his favorite rocking-chair all afternoon, as he carried on his political conferences.

To those who knew Theodore Roosevelt in the intimate and friendly atmosphere of Sagamore Hill, this book of his letters to his children is no revelation; but it furnishes perhaps an even keener delight to them than it furnishes to those startled others, since it gives as possibly no other written record could, a reflection of that wise, warm-hearted human being, so gay, so boyish, so full of tenderness and humor, who was the master, and the pervasive spirit, of Sagamore. In these letters, the man of the cartoons gives way to the sympathetic father, the playmate without peer, the boy who never grew up.

The collection begins with the period of the Spanish War, although hidden in some drawer somewhere, there must be similar letters written during his ranching days, for he began sending illustrated communications to his children from the time the oldest of them was scarcely more than a year old. The great affairs of this world

[1] *Theodore Roosevelt's Letters to His Children*, edited by Joseph Bucklin Bishop. Charles Scribner's Sons, New York, 1919.

are touched on here and there, but only touched on.

"Tomorrow the National Convention meets," he writes to Kermit on June 21, 1904, "and barring a cataclysm I shall be nominated." But he seems less interested in the surge of great human currents at Chicago than he does in the little matters of daily life which make the world of his children. On that same day—the day preceding also the transmission of the famous ultimatum, "We want Perdicaris alive or Raisuli dead"—he wrote from the White House to each of his four younger children.

"The garden here is lovely," he tells Ethel. "A pair of warbling vireos have built in a linden and sing all the time. The magnolias are in bloom, too, and the jasmine on the porch."

"Blessed Archikins" receives word the same day concerning Bill the Lizard. "The other day when Mother and I were walking down the steps of the big south porch," writes his father, "we saw a movement among the honeysuckles and there was Bill the Lizard—your lizard that you brought home from Mount Vernon. We have seen him several times since and he is evidently entirely at home here. The White House seems big and empty without any of you children puttering around it, and I think the ushers miss you very much."

But it is "Dear Quentyquee" who receives that day the most weighty communication of all. "The other day when out riding what should I see in the road ahead of me but a real B'rer Terrapin and B'rer Rabbit. They were sitting solemnly beside one another and looked just as if they had come out of a book; but as my horse walked along B'rer Rabbit went lippity lippity lippity off into the bushes and B'rer Terrapin drew in his head and legs till I passed."

On the day following (while the Convention was opening its deliberations and the chancelleries of Europe were beginning to mutter and flutter and hold up their metaphorical hands at the implications of the Moroccan ultimatum), the President was writing and elaborately illustrating a letter to Ethel, including among other works of art a picture of a policeman and a squirrel which bore this caption: "A nice policeman feeding a squirrel with bread; I fed two with bread this afternoon." What after all were presidential nominations and ultimatums in comparison with matters of such import?

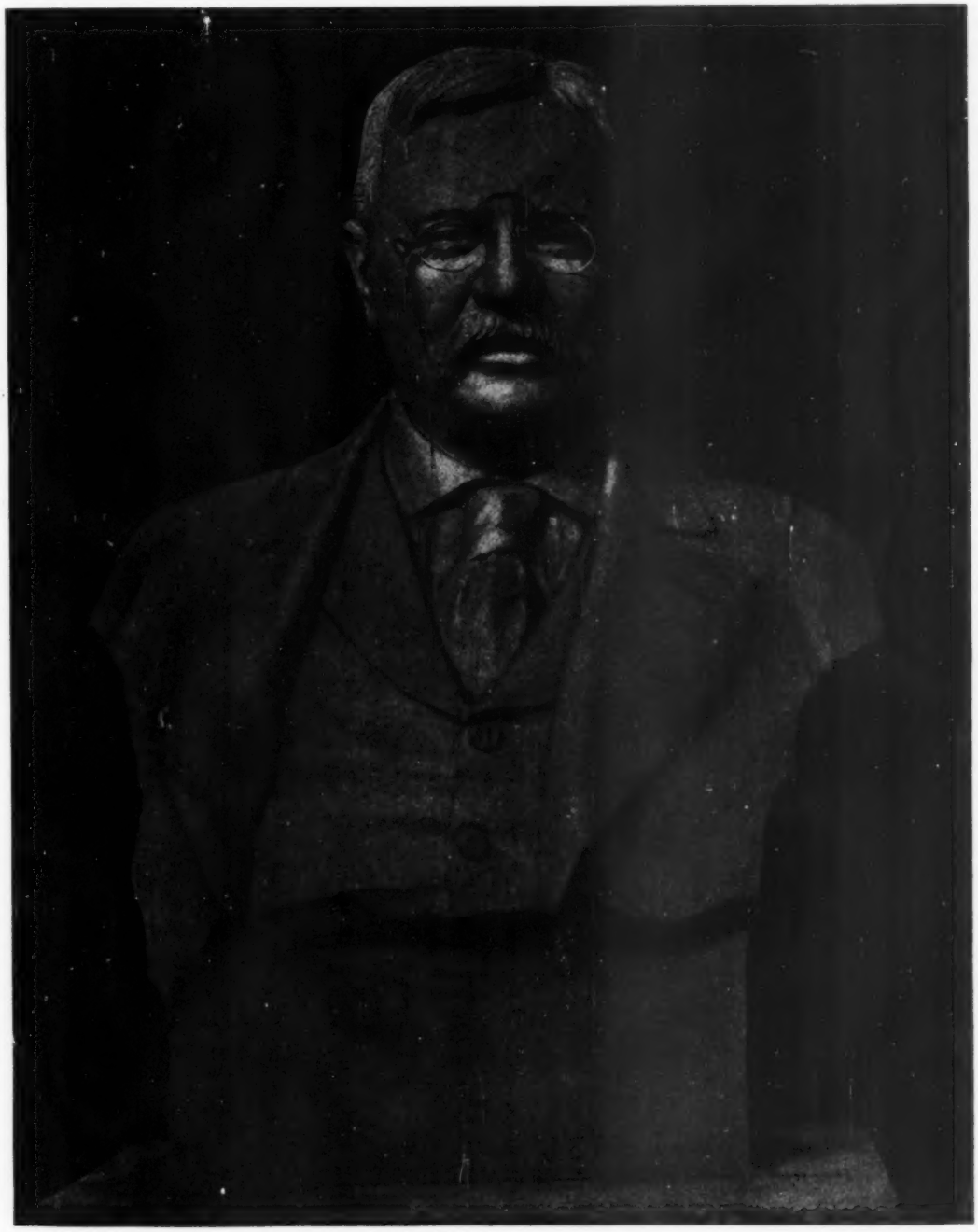
Roosevelt was and remained, among his children's companions, the best beloved and most eagerly sought after. His sympathetic understanding enabled him to meet them always on the level of development on which they stood. As they grew he seemed to grow with them. Imperceptibly almost, as the years go on, the letters deepen, and in place of the stories of lizards and rabbits, come analyses of the relative merits of Japanese and American methods of wrestling and bits of sage advice given almost apologetically concerning studies or athletics or the choice of a career.

Theodore Jr's arrival in college drew from the President a series of indignant and sympathetic letters concerning "the newspaper men, camera creatures and idiots generally" who beset the path of one whose home address happened to be the White House. To Kermit he wrote largely of books. Through all the letters runs the delight of living, the joy in beauty of color and sound and fragrance, the quiet contentment of a happy home.

Books will be written without number in the years to come concerning Theodore Roosevelt, and many will tell of the things he did and many will paint or attempt to paint the man that he was. But this book of his own letters to his children will always stand alone, for in it lives and breathes forever the very man himself.

SCULPTURES OF THE LATE THEODORE ROOSEVELT

BY FRANK OWEN PAYNE[1]

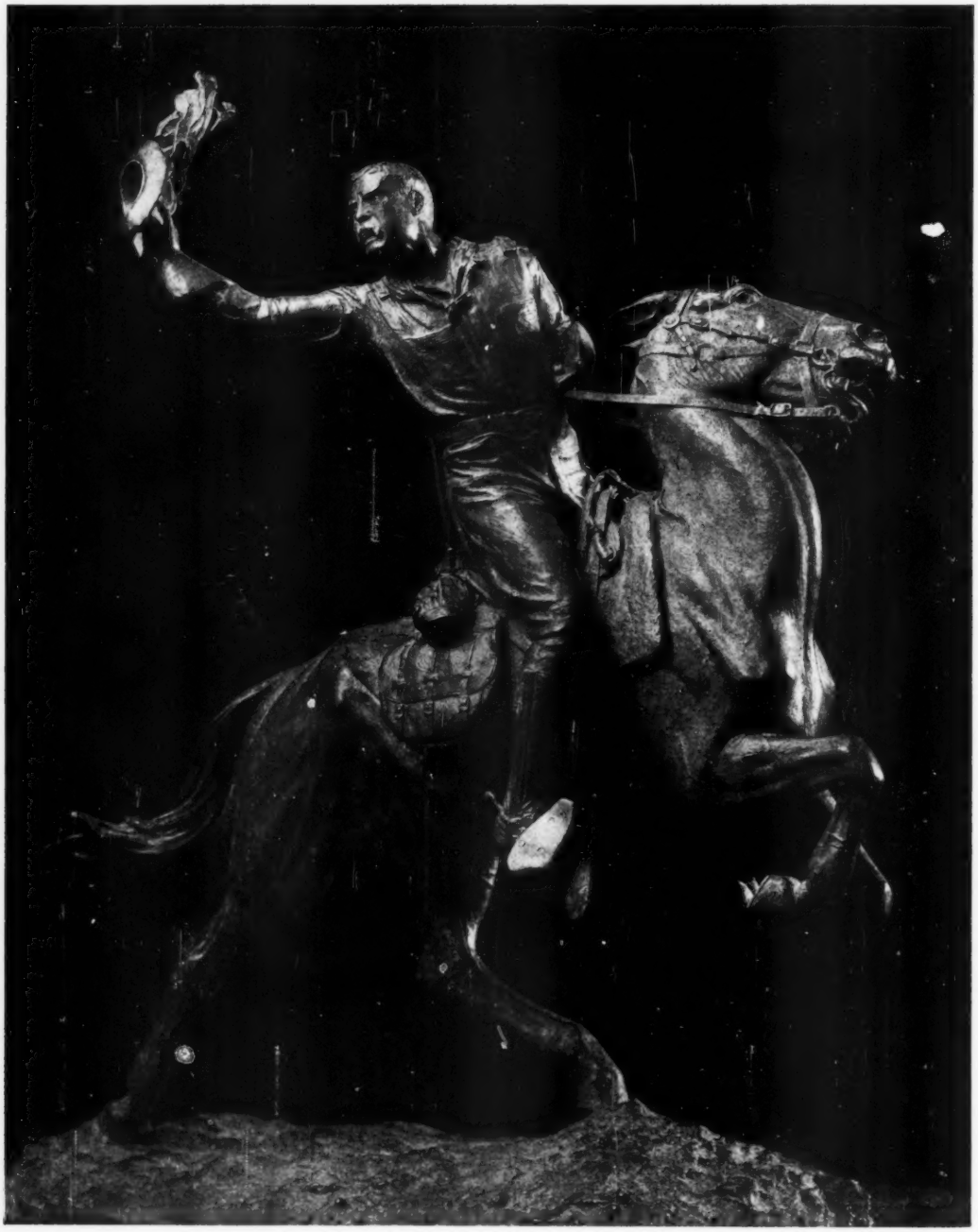


THE MAN OF LETTERS

Roosevelt Bust, recently executed by John Ettl

This portrait bust is intended to depict Theodore Roosevelt as he appeared in later life—as the lover of books, the contributing editor, the creative man of letters. It is based on the death mask and on one of his best known photographs of recent years

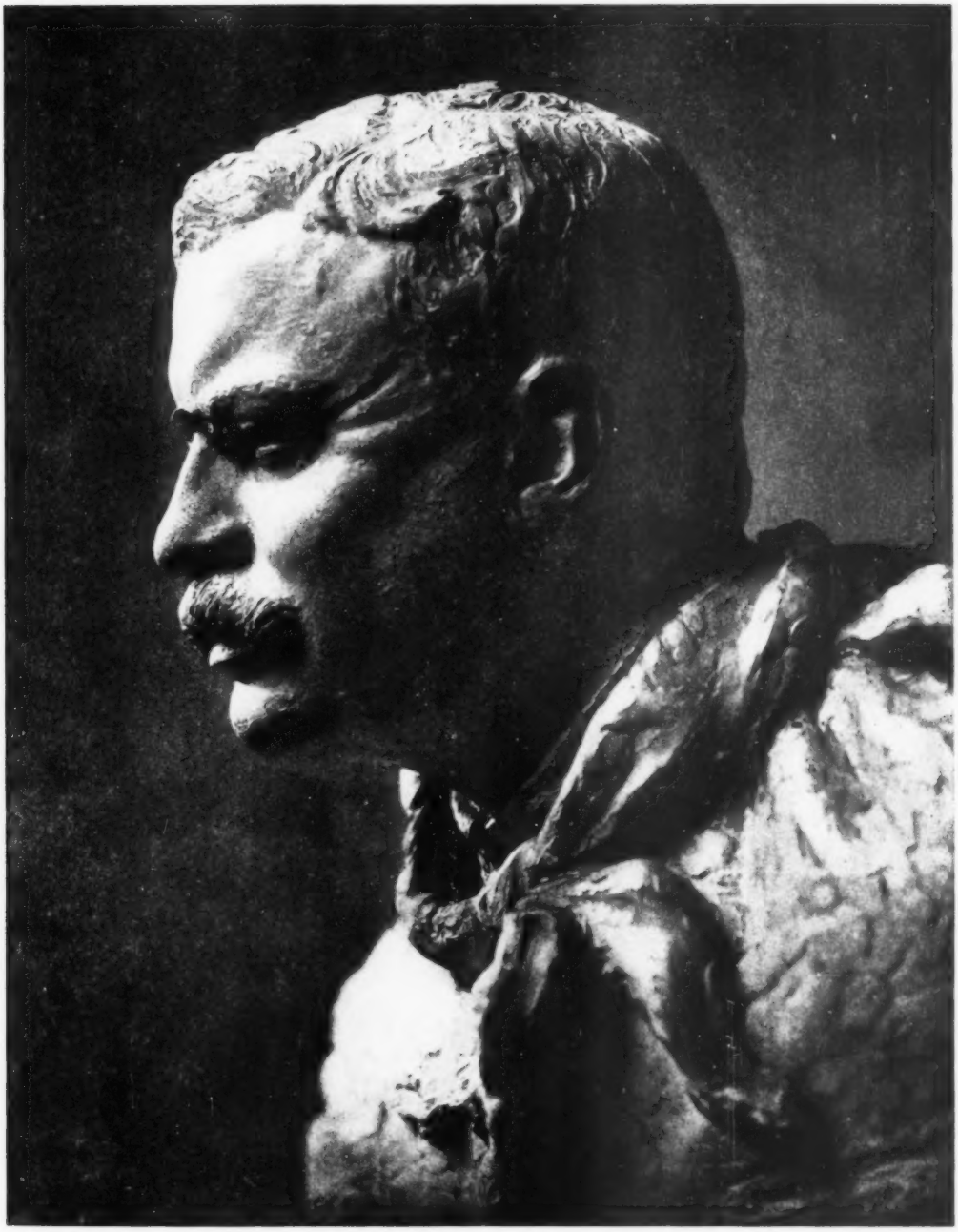
[1] Contributor on sculptural subjects to *Art and Archæology*, *International Studio*, *Architectural Record*, etc.



THEY GLADLY FOLLOWED WHERE HE LED

Bronze statuette by James E. Kelly

A sculptor's portrayal of Theodore Roosevelt as a military leader of his regiment of Roughriders. Roosevelt refused a sitting for this, when urged by the sculptor, after returning from Cuba; but granted it later on learning that the sculptor was the author of "Sheridan's Ride." For that inspiring bronze was then in his own study: he had seen it one day in Tiffany's window, when he was just out of Harvard, and had been so impressed by its spirit that he sacrificed other things to buy it. Replicas of this portrait of Roosevelt, sent to grammar schools, for the boys of America to see daily, would be well worth the monetary cost



A PORTRAIT THAT WILL ALWAYS LIVE

"The Senate Bust," by James E. Fraser

A sculptor's portrayal of Roosevelt as President of the United States. Roosevelt would not "waste time" in sittings, so Mr. Fraser did the work at the regular Cabinet meetings. His subject was not easy to model, for Roosevelt was absorbed in business of state, his pose never constant, and his expression continually changing. The bust which was executed in marble for the United States Senate Chamber is represented with the conventional vesture of the Chief Executive, rather than with the Roughrider garb of the sculptor's original work. (John Burroughs, after touring and camping through the West with Roosevelt when he was President in 1903, reports that he said all he cared about being President was just "the big work." Our California redwoods need the big work of just such a man as he today)

THE DEATH MASK

By James E. Fraser

Immediately after death came, the sculptor who had modeled the living Senate Bust was called to make the last record of the head and features of Theodore Roosevelt. This record, in the white plaster, gives the authoritative form for all sculptures of the future, and without the fire and the spirit, still carries the nobility and heroic sincerity and strength which molded the face of the Roosevelt we knew

THE MAN OF MENTAL GRASP AND PRODIGIOUS MEMORY

Medal, by Saint Gaudens and Weinman

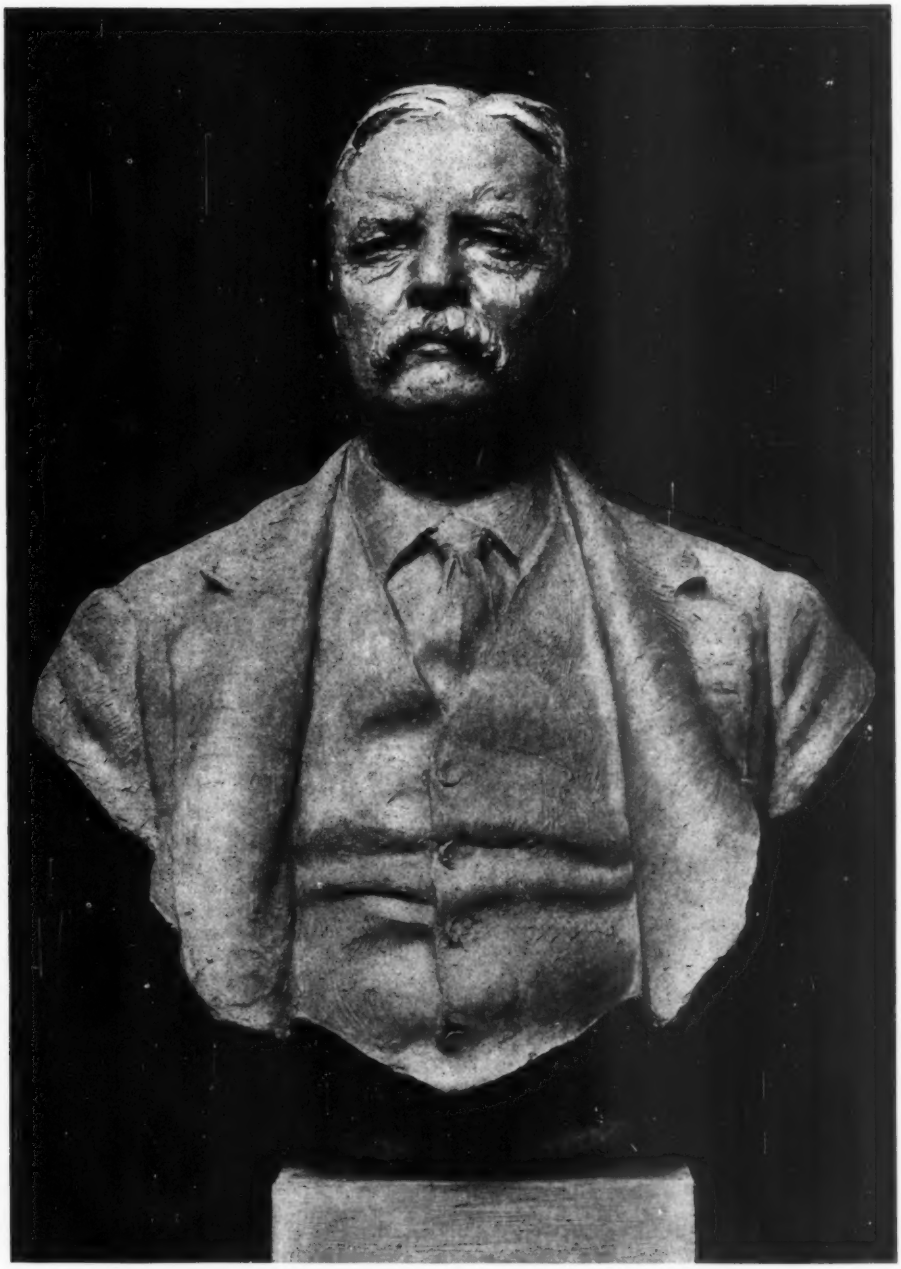
It is a source of gratification that two such eminent medalists as Augustus Saint Gaudens and Adolph Weinman united their efforts in the execution of a medal bearing the head of Theodore Roosevelt. The work carries the combined monogram of the two sculptors. Mr. Weinman says that even he himself cannot tell just what features are the work of his hand and what are the work of Saint Gaudens. This medal must rank with the works of first importance among the Roosevelt sculptures

IN WAR A FIGURE OF UNRIVALED ARDOR AND DARING

Roosevelt, in the statuette by Frederick MacMonnies

Modeled and executed in MacMonnies' Paris studio soon after the war with Spain and presented by the sculptor to Roosevelt when he was President. The photograph reproduced here is from the original statue, the property of the Roosevelt family, who have always set high value on it because of its truthful portrayal of Roosevelt's enthusiasm. So far as known, this is the only copy in America.

Today, at the close of 1919, when the great personal Roosevelt of our time is passing into the Roosevelt of history and memory, we are beginning to see him in his permanent proportions and are united in desire to do honor to him in great and unique ways. Representative of his "spirit of youth and swift strength and mounting joy of life," an American flag was carried by relays of young American boys from station to station across New York State and through the city of his birth, stars were sewed on by young American girls at each stop, and the completed flag finally brought to his grave at Sagamore Hill



AT THE BEGINNING OF HIS CAREER AS STATESMAN

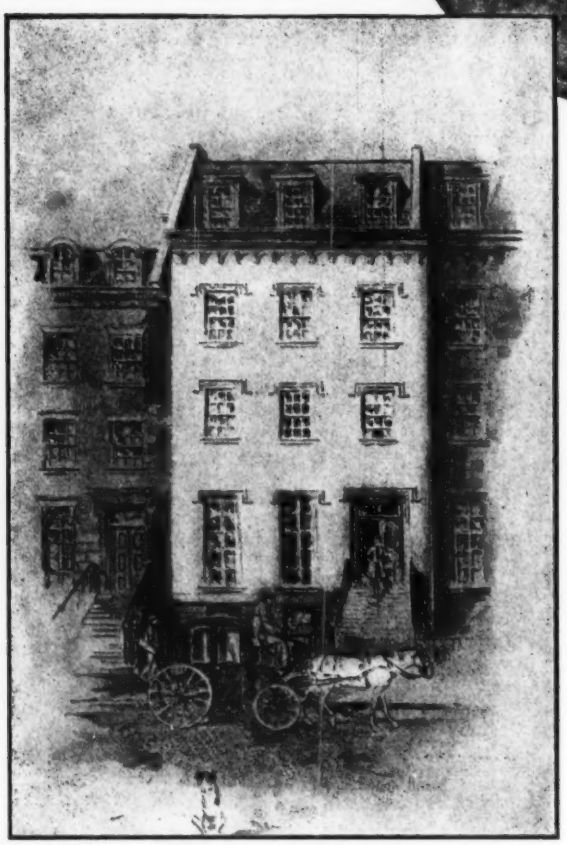
Bronze Bust, by J. Massey Rhind

Within the imposing memorial structure at Niles, Ohio, which marks the birthplace of the martyred President McKinley, are portrait busts of the Vice President, Theodore Roosevelt, and many important men of McKinley's administration—Elihu Root, Mark Hanna, John Hay, and others. This Roosevelt portrait stands at the right of that of McKinley and in the expression there seems to be foreshadowed the dread moment when the shocking news of the assassination of McKinley came. Mr. Rhind's work shows the young statesman (without quite the characteristic look of the man, largely because of lack of the eyeglasses he habitually wore) who was soon to step into the duties and responsibilities of President

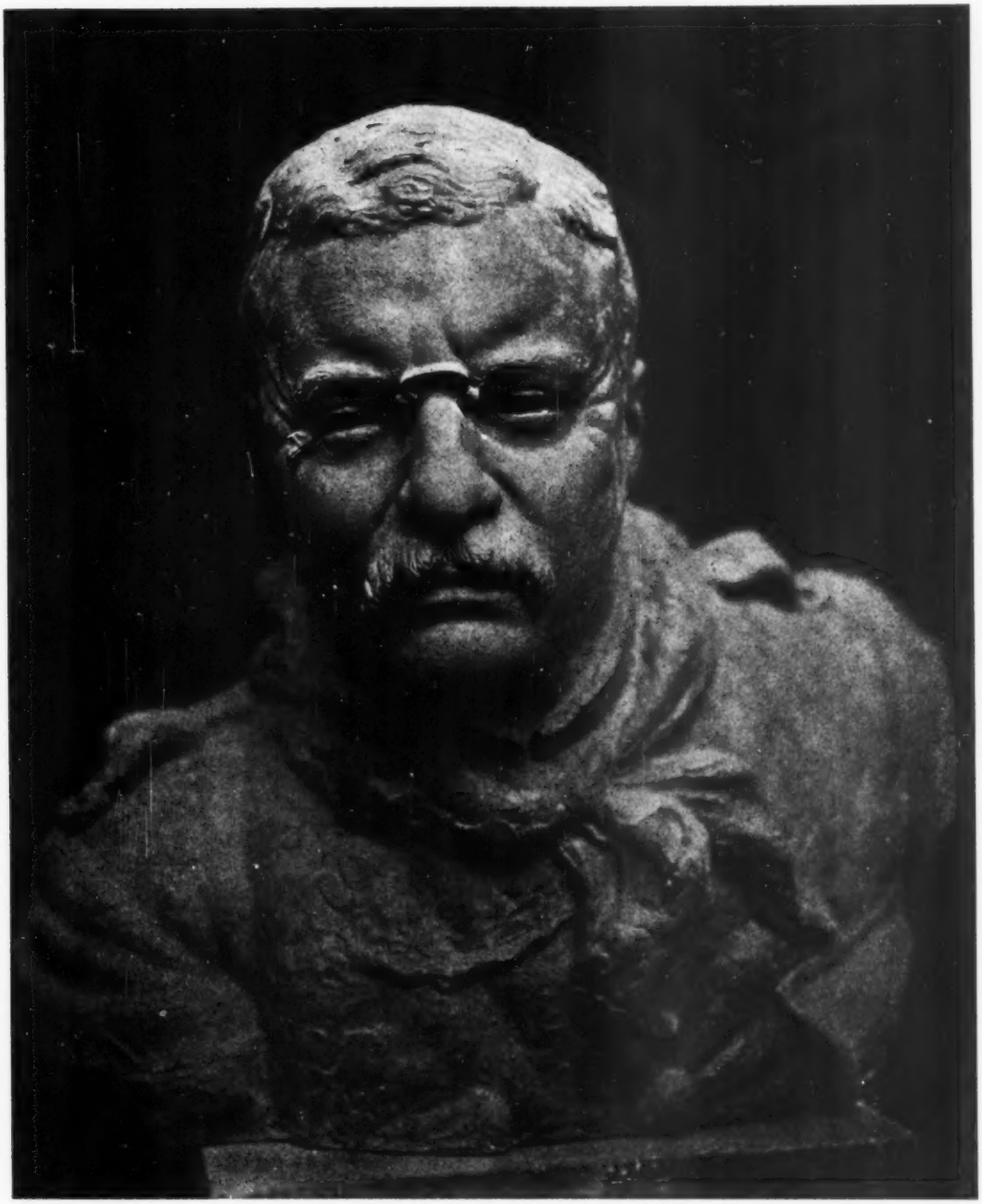
PORTRAIT FROM A FAMILIAR PHOTOGRAPH

A medal by Anna Vaughn Hyatt

Subscribers to the fund of the Woman's Roosevelt Memorial Association, representative of all political parties and every religious faith, are presented with a copy of this medal. The Association has purchased the house in which Theodore Roosevelt was born, at No. 28 East Twentieth Street, New York City, and will make it, together with the house which adjoins it, into a permanent memorial, with the aim of continual promulgation of the principles of Americanism



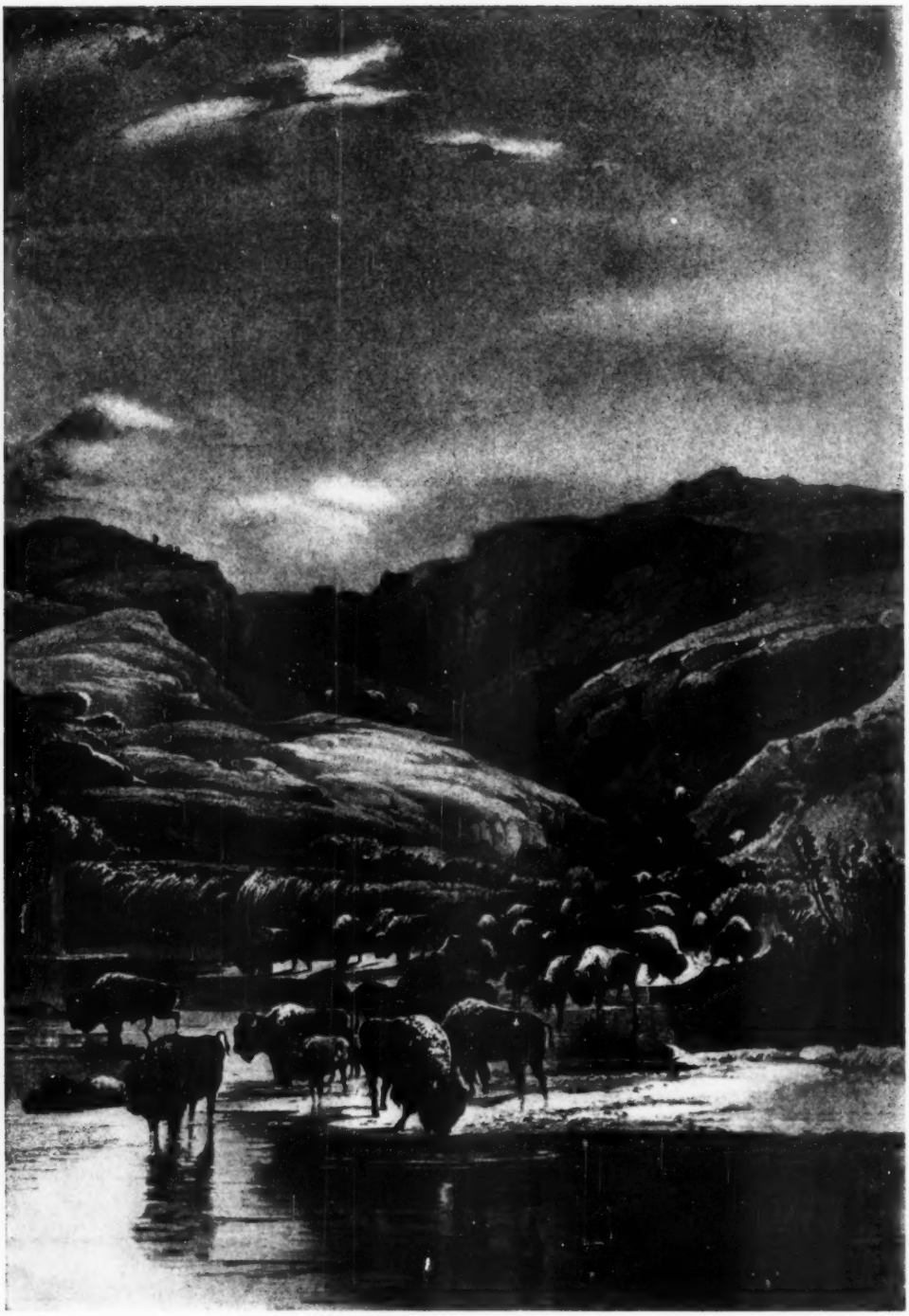
On October 27, the anniversary of the birth of Roosevelt, Major General Leonard Wood, in speaking for the Roosevelt Memorial Association, said: "Theodore Roosevelt stood for universal service in war as well as in peace, service for each one wherever he could best serve. Theodore Roosevelt stood for the square deal, one flag, one language, and one loyalty—loyalty to the American people—for industrial justice, for public and private morality, for a strong and vigorous America, charitable and helpful, ever ready to do her duty to civilization and humanity, but an America always under the dictates of her own conscience rather than under the direction of others"



FOR ALL TIME A LEADER AMONG AMERICANS

The Roosevelt who will always stand for that "intense Americanism" which will make us use our strength not only for ourselves but also for the less fortunate, "well-behaved" small nations of the earth. Bust by James E. Fraser (compare with profile view)

Article X of the League of Nations embodies the intense Americanism Roosevelt preached—a promise that the United States, Great Britain, and France, will not abandon the small peoples of the earth, proclaimed free at the Peace Conference in Paris. Never before in all the course of history has any other nation enjoyed the profound admiration given to the people of the United States—because our spirit of Americanism, both in the World War and at the Peace Conference, stood firm as a rock for the rights of others. It is the pleasure of the great, as well as their sacred duty, to protect the weak



BISON HERD WENDING ITS WAY TO A WATERING PLACE ON THE UPPER MISSOURI

In the days when the bison grazed at will over the continent and herds numbering thousands moved together through the hills to their watering places, they made trails which were masterpieces of engineering. Many of these well-worn pathways remain as conspicuous monuments of the bison's former numbers, and mark out the routes now followed by automobile road or railway.

This illustration shows a section of a picture by Bodner, the artist who accompanied Prince Maximilian on his famous trip through central United States in 1832–34

The Coming Back of the Bison

By C. GORDON HEWITT

Consulting Zoölogist to the Commission of Conservation, Ottawa

THE disappearance of the American bison to the verge of extermination constitutes one of the greatest and most striking catastrophes to our wild life that have occurred in the experience of modern man. The manner in which the total loss of this magnificent animal as a member of our fauna has been prevented should fill all who are endeavoring to conserve our wild life on this and other continents with confidence and hope.

There has always remained in my mind the impression which I received when, as a student of zoölogy, the tragedy of the American bison was brought home to me by a little colored chart in the Manchester University Museum showing the past and present distribution of this animal and its gradual decrease in numbers. Frank Evers Beddard's excellent volume on "Mammalia" in *The Cambridge Natural History* had recently been published, and the sad history was summarized in these words: "The Bison of America, formerly present in such numbers that the prairies were black with countless herds, has now diminished to about a thousand head." Little did I think at that time that I should later become directly interested in the bringing back of the bison.

The extent of the destruction of the bison appalls us by its immensity when we consider the character of the animal. It would seem inconceivable that this, the largest of the wild fauna of our continent, should have been reduced within the limits of the last century from countless millions to the point of extermination. Formerly ranging over about one third of the entire continent it has been practically wiped out of existence except for a small band of so-called "wood bison" now to be found in the Athabaska region of Canada. That its disappearance was an inevitable result of the development of the country does not diminish the character of the tragedy. The bison is the greatest of all our American animals and undoubtedly the most noble of its family in any part of the world. Now it has practically disappeared from the face of the continent and only by the foresight of the Canadian and United States governments has it been prevented from becoming completely exterminated. The history of its disappearance and the most complete account we have of this noble member of our native fauna have been given in a memoir by Dr. W. T. Hornaday, director of the New York Zoölogical Park.[1]

Its former range in North America according to Hornaday, was as follows: "Starting almost at tide-water on the Atlantic coast, it extended westward through a vast tract of dense forest, across the Alleghany Mountain system to the prairies along the Mississippi, and southward to the Delta of that great stream. Although the great plains country of the West was the natural home of the species, where it flourished most abundantly, it also wandered south across Texas to the burning plains of northeastern Mexico, westward across the Rocky Mountains into New Mexico, Utah, and Idaho, and northward across a vast treeless waste to the bleak and inhospitable shores of the Great Slave Lake itself." The vast herds of bison seemed to clothe the prairies in a coat of brown. They were as thick as the leaves in the forest. These immense herds greeted the ad-

[1] W. T. Hornaday, *The Extermination of the American Bison*, Washington, 1889.

Photograph by C. Gordon Hewitt

Jamieson Lake is one of several in Buffalo Park. These serve not only as watering places for the bison, but also as sanctuaries for large numbers of waterfowl. In time the bison ranges should support herds of elk also, of deer, and antelope, natural neighbors which live together in the greatest harmony. The bison, when given a chance by protection against hunters, increases so rapidly that already the problem has arisen as to what disposition should be made of the surplus animals. It is hoped that new ranges will be established and possibly that domestication for commercial purposes may be inaugurated

vance guards of civilization and that process spelled their doom.

The history of the bison is an illustration on the largest possible scale of the history of every species of wild animal when man invades its natural haunts with an unrestrained desire to kill. No part of our wild life can withstand the destructive influence of man armed with modern guns; the only salvation for any species is the restriction by law of the number that may be killed. These considerations, however, had no part in the early days with the bison. It was faced by men armed with powerful firearms who killed without any regard for the future, and there was a complete absence of any restrictions on the part of all the governments concerned. The Indians who had always regarded the bison as the source of their meat supply had their point of view entirely changed so far as the number of animals to be killed was concerned. Their passion for killing was inflamed by the example of the white hunters with serious economic results when their source of meat was wiped out.

Various methods of slaughter were followed. The extraordinary stupidity of the animals made them an easy prey for the still-hunters. Still-hunting was conducted on business lines and was highly profitable when more than a hundred animals could be killed from one stand and the robes were worth $2 and $4 each. The practice of hunting on horseback provided an exciting sport and when the hunters, white, half-breed, and Indian, went out in armies the results were disastrous to the herds, particularly as the cows were especially chosen owing to the superior value of their skins. A favorite method employed by the Indians was that of impounding or killing the animals in pens into which they were driven. This method was commonly practiced among the Plains-Cree in the South Saskatchewan country. The terrible scenes that attended these wholesale slaughters of the herds are beyond description. Other methods of slaughter on a large scale were surrounding, decoying, and driving the animals, and all tended toward the same end—complete extermination of the herds. As the animals

became scarce the half-breeds and Indians vied with the white hunters in destroying them. Far more bison were destroyed than could possibly be utilized.

But this could not long continue. No longer did the prairies thunder with the sound of thousands of galloping hoofs. The great herds were driven farther and farther afield. Indians who formerly merely cut out the tongues of their victims, if they took any part of the carcass at all, now almost starved for want of food. In 1857 the Plains-Cree inhabiting the country around the headwaters of the Qu'Appelle River decided that on account of the rapid destruction of the bison by the white men and half-breeds they would not permit them to hunt in their country or travel through it except for the purpose of trading for their dried meat, pemmican, or robes.

Catlin[1] has given some idea of the enormous numbers of bison that were killed during the first half of the nineteenth century. In 1832 he stated that 150,000 to 200,000 robes were marketed annually, which meant a slaughter of 2,000,000 or perhaps 3,000,000 bison. So great was the destruction that he prophesied their extermination within eight or ten years. Frémont about the same time also bore witness to the appalling destruction.

The death knell was struck when the construction of the Union Pacific Railway was begun at Omaha in 1866. Previous to the advent of the first transcontinental railway the difficulties of marketing the results of the slaughter served as a slight check on the rate of extermination for, although the bison were being killed out at a rate greatly in excess of their natural increase, they would have existed for some years longer than the coming of the railroads and additional swarms of white hunters rendered possible. This railroad divided the original great body of bison into southern and northern herds. That was the beginning of the end. Although the range of the northern herd was about twice as extensive as that of the southern, the latter contained probably twice as many bison. Hornaday estimates that in 1871 the southern herd contained 3,000,000 animals, although most estimates give a higher total than this.

[1] George Catlin, *Illustrations of the Manners and Customs and Conditions of the North American Indians*, London, 1841.

Photograph by C. Gordon Hewitt

Bison do not always show respect for a fence; consequently the enclosure must be given genuine stability. The nine-foot fence at Buffalo Park is composed of fourteen strands of galvanized steel wire, strengthened with upright wires at one foot intervals. On either side of the fence a strip twenty-five feet wide is kept plowed as a fire guard and similar guards against prairie fires are cut across the preserve. A one-horse team, journeying nearly five hundred miles throughout the year, keeps the guard strips permanently broken up

Photograph by Wainwright Studios

THE MONARCH OF THE PLAINS ON HIS ANCIENT FEEDING GROUNDS

Buffalo Park, near Wainwright, Alberta, has been secured by the Canadian Government for its great bison herd. Numerous traces of buffalo trails and wallows prove this well-watered park with its luxurious growth of buffalo grass to have been a favorite pasturage in ancient days. Canada has set aside 160 square miles and surrounded these with a seventy-six-mile fence including more than 25,000 posts and 1700 miles of wire. The bison were recruited in 1907 by purchase of a private Montana herd of 709 head, and by natural increase under ideal conditions these have multiplied to 3711 head, or more than three times the number of bison alive in 1889. The United States Government has also established several bison ranges so that now there are probably more than 7000 bison on the continent and the species is well out of danger of extinction

Photographs by C. Gordon Hewitt

SALVAGED REMNANT FROM THE MILLIONS THAT ONCE ROAMED THE CONTINENT

Probably no large quadruped has ever developed in such prodigious numbers as did the American bison in the days of its glory. The Central Plains, literally black with these huge oxen, supported countless millions which, except for a small tribute to the Indians and the wolves, roamed undisturbed. Even as late as 1871 there was observed migrating across the southern plains a single wedge-shaped herd on a twenty-five-mile front with a depth of fifty miles. Such a drove could contain no fewer than four million head. But of former myriads there were left in 1889 only about six hundred wild bison over the entire continent. From this small nucleus several herds were recruited of which the largest is now in Buffalo Park, Alberta, Canada. The photographs show the bison in small scattered groups as is their usual custom on the range

The slaughter of the southern herd began in 1871 and reached its height two years later. From 1871 to 1872 the wastefulness was prodigious. The skins that were marketed bore no indication of the enormous slaughter. In four short years the great southern herd was wiped out of existence, and by 1875 it ceased to exist.

By the time the destruction of the northern herd began in earnest, the bison in Canada had already become very scarce. The remnants of our former herds were assiduously hunted by the Indians as they constituted their main supply of food. As Hornaday states: ". . . the herds of British America had been almost totally exterminated by the time the final slaughter of our northern herd was inaugurated by the opening of the Northern Pacific Railway in 1880. The Canadian Pacific Railway played no part whatever in the extermination of the Bison in the British Possessions, for that extermination had already taken place. The half-breeds of Manitoba, the Plains-Cree of Qu'Appelle, and the Blackfeet of the South Saskatchewan country swept bare a great belt of country stretching east and west between the Rocky Mountains and Manitoba. The Canadian Pacific Railway found only bleaching bones in the country through which it passed. The buffalo had disappeared from that entire region before 1879 and left the Blackfeet Indians on the verge of starvation. A few thousand buffaloes still remained in the country around the headwaters of the Battle River, between the North and South Saskatchewan, but they were surrounded and attacked from all sides, and their numbers diminished very rapidly until all were killed."

The main part of the northern herd was to be found in the United States. Here the Indians of the northwestern territories were waging a relentless war on the animals. Hornaday computes that the number of bison slaughtered annually by those tribes must have been about 375,000. The destruction of the northern herd began in earnest in 1876 and became universal over the entire range four years later. By this time the annual export of robes from the buffalo country had diminished three fourths. The construction of the Northern Pacific Railway hastened the extermination of the herd. White and Indian hunters killed so long as there were buffaloes to kill. The hunting season which began in 1882 and ended in February, 1883, completed the annihilation of the great northern herd and only a few thousand head were left, broken into straggling bands. The last shipment of robes was sent out from the Dakota Territory in 1884. In 1889, Hornaday, on the basis of all available data, estimated that the number of buffalo running wild and unprotected was 635 animals! Was the destruction of an animal ever so completely brought about? It furnishes what is undoubtedly the most striking and appalling example of the fate of an animal existing in apparently inexhaustible numbers, when left exposed to unrestricted slaughter, and should be a serious lesson to the people of this continent and of the world for all time. That in the face of advancing civilization the buffalo had to go was inevitable. It occupied lands that were to furnish homes and occupation for millions of immigrants and that now produce so large a part of the world's staple crop.

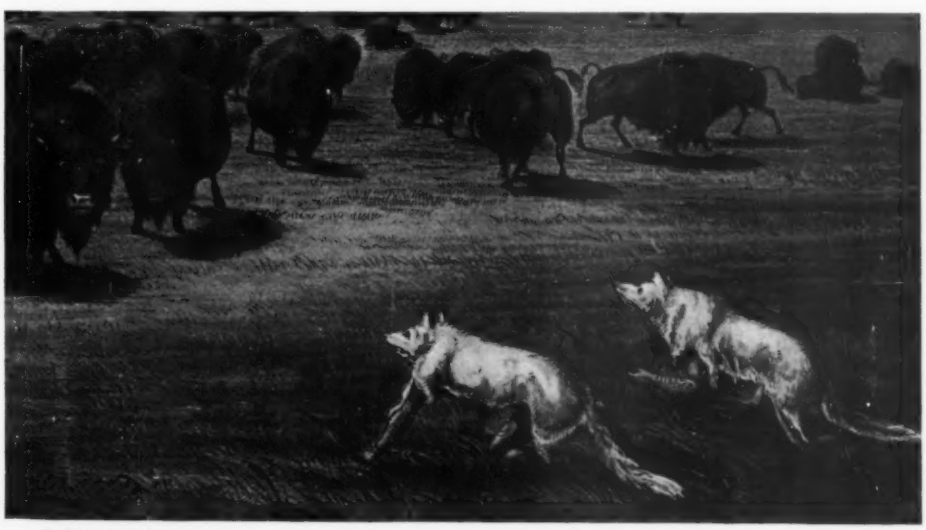
Time, however, will not efface the traces of the bisons' occupation of the continent. They blazed the trails that later became important highways. As A. B. Hulbert in his *Historic Highways of America* has pointed out, the bison selected the route through the Alleghanies by which the white man entered and took possession of the Mississippi Valley. They found the best routes across the continent and "human intercourse will move constantly on paths first marked by the buffalo." It is interesting that the bison found the strategic passageways through the mountains; it is also interesting that

they marked out the most practical paths between the heads of our rivers, paths that are closely followed today by the Pennsylvania, Baltimore and Ohio, Chesapeake and Ohio, Wabash, and other great railroads.

But there came finally a brighter period in the history of the bison in America. In 1889, when they had reached their lowest level, there were only 256 buffalo in captivity, 200 protected by the United States Government in the Yellowstone Park, and 635 running wild, of which number 550 were estimated to be in the Athabaska region of the Canadian Northwest Territories; the whole bison population at that time was estimated to be 1091 head. An attempt was now made in the United States to protect the remnant and by 1903, according to the census of the American Bison Society, they had increased to 1753 head. These were chiefly confined in the national reservations and parks of the United States Government; some were owned by private individuals. The largest private owner appears to have been Michael Pablo, of Montana, who had a herd of about 700 animals in 1906, the value of which he fully appreciated.

In 1907 the Canadian Government learned that the Pablo herd was for sale and with commendable foresight purchased it, realizing the importance of acquiring so valuable a herd of what had formerly been the most abundant of our large native mammals. For its reception and maintenance a special national park was established at Wainwright in Alberta. This reservation covers an area of about 160 square miles, the whole of which is enclosed in a special wire fence about 76 miles in length. Judging by the abundance of old bison wallows it evidently formed a favorite place for bison in years gone by. Several lakes, the largest of which is Jamieson Lake, about seven miles long, provide an ample water supply. The difficulties involved in the capture of the Pablo herd of bison and the transportation of the animals to the Buffalo Park at Wainwright, Alberta, can better be imagined than described. From the date of the receipt of the last animals in 1909 they have increased steadily each year until in 1918 they numbered 3711 head, or more than three times the total number of bison known to be living in North America in 1889.

The United States Government also took steps to protect and increase the herds of bison remaining. A national bison range was established in Montana; and in the Yellowstone National Park and other national reservations



Indian hunters under cover of wolf skins approaching a herd. From a sketch by George Catlin

the bison were carefully protected, with successful results.

There are now eight herds protected by the United States Government comprising altogether 891 animals. The largest number is contained in the Yellowstone National Park, Wyoming, where there were on January 1, 1919, 457 animals. In the Montana National Bison Range there were 242 animals on the same date, and the third largest herd is to be found in the Wichita National Forest and Game Reserve in Oklahoma where there are about 100 bison.

The total number of captive bison in the United States in January, 1919, according to a statement kindly furnished to me by Mr. M. S. Garretson, secretary of the American Bison Society, was 3048 head. It is estimated that there are also about 70 wild bison, making a total of about 3118 bison in the United States.

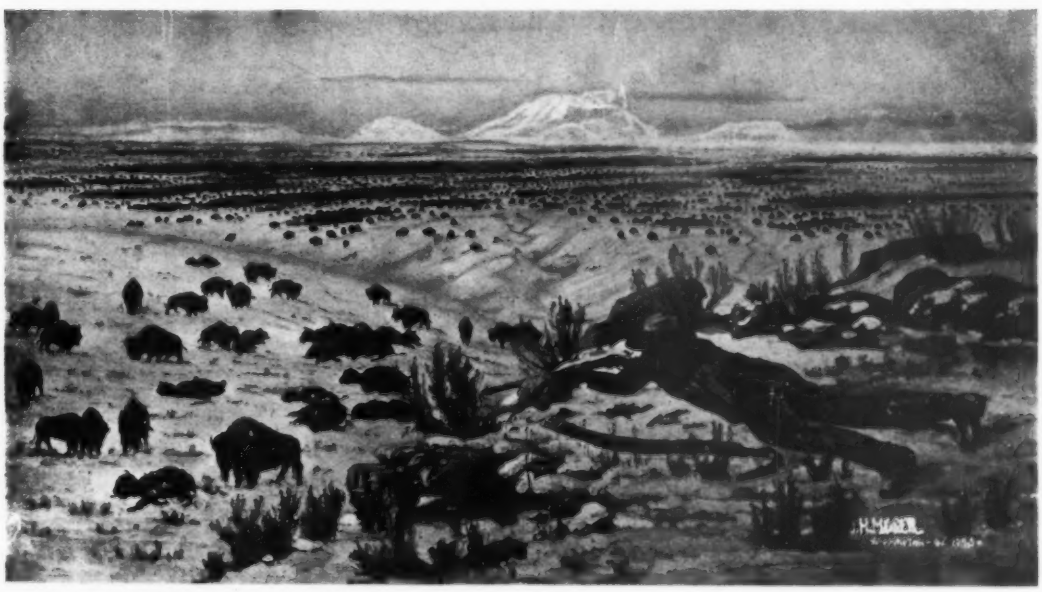
In Canada the Canadian Government has bison in three of the national parks. In 1918 the numbers of bison in these reservations were as follows: in Buffalo National Park, Wainwright, Alberta, 3520 animals; in Elk Island Park, Alberta, 183; and in the Rocky Mountains Park, Banff, Alberta, 8; making a total of 3711 head. In addition it is estimated that there are about 500 wild bison, or wood bison, in the Athabaska region where they are now protected. Scattered throughout the Dominion in public and private parks there are approximately 40 additional bison. The total number of bison in Canada at the beginning of 1919, therefore, was about 4250 animals.

From the above estimates it will be seen that we have now approximately 7360 bison in the United States and Canada, as compared with 1091 in 1889. These figures show that the bison are coming back, and that they are doing so rapidly.

The rapid increase of the bison in our national reservations raises the question: "What shall we do with our surplus?" In the Buffalo Park at Wainwright, Alberta, this question is becoming a serious one as they will soon occupy as much range as is capable of sustaining them. The natural answer to this question is to create additional reservations, which policy undoubtedly will be followed, particularly in the United States where much additional range suitable for bison but less suitable for agricultural purposes is available. In addition provision is being made for the donation of surplus animals to municipalities, public organizations, and institutions. But cannot we go a step farther and consider the desirability of encouraging farmers to purchase surplus animals from the government and to maintain them? Anyone who has visited the bison in our national reservations will agree that if they were maintained in a semidomesticated state they could be treated in the same manner as range cattle, provided they were enclosed. The cost of building suitable fencing might prove an obstacle in many cases, but it should not prove insuperable in view of the high price of beef. As a beef animal the value of the bison is well worth the careful consideration of our agricultural authorities. In addition it provides a robe of proven value in more northerly states and provinces. Not the least of the advantages of the bison over domestic cattle is their ability to "rustle" for themselves in winter and under climatic conditions which prove a hardship to our introduced cattle.

The proposal to utilize the bison in the manner suggested may appear impracticable, but how many of our ideas as to what was possible and what was impossible have, in the course of time, proved unfounded? The future alone will show. In the meantime all who are interested in the conservation of our wild life will be encouraged to further efforts by the story of the manner in which the bison was rescued from the fate which has befallen less magnificent members of the world's mammalian fauna.

Impounding bison was the wholesale and wasteful method of killing employed by the Assiniboin, Plains-Cree, and other Indian tribes of the Northwest, a method which allowed all members of the tribe, even the women and children, to be in at the death. The pound was constructed of logs and its gate placed under a ledge down which the bison could jump but which was too high for them to climb again. From this gate a fan-shaped runway several miles out into the plain was constructed by means of bunches of branches and bushes, known as "dead men," lined up fifty feet apart. Behind these "dead men" the Indians hid and frightened back the herd whenever it showed signs of departing from the track. After the bison had been stampeded into the pen the tribe gathered around to slay the fright-maddened animals which charged wildly about crushing and tossing one another. Several hundred might be killed by this method in a single foray. The illustration is from a cut (engraved from a photograph) in Hind's *Narrative of the Canadian Red River Exploring Expedition of 1857*



"The Still Hunt," from a painting in the National Museum, Washington, by J. H. Moser, 1888.—With the coming of the railroads through the West and an increased demand for buffalo robes, the butchery of the "still hunt" began. Other methods were too slow for the commercial hunter who must kill hundreds of bison in order to realize on pelts worth but from 65 cents to $4 a piece. The still hunter approached the herd to within one hundred to two hundred and fifty yards and proceeded with great deliberation to shoot down the animals without stampeding them. Their leader, usually the oldest cow, was first disposed of, and then the others slaughtered one by one. Any individual of the herd which attempted to lead off the others was promptly stopped by the hidden rifle. The target on a bison is about a foot in diameter but even with a mark of that size and employing a high power rifle, the professional hunters were usually such poor shots that they scored only one death out of about every three hits, the other two bullets inflicting broken legs and collar bones. One to two shots a minute could be fired and with good luck a hundred bison killed from one "stand" so that one hunter was able to account for from one to three thousand head a season

THE DANGEROUS SPORT OF BUFFALO RUNNING

From a drawing by Bodmer, the artist of the Maximilian Expedition, 1832–34

The hunting of bison by charging a herd on horseback was an exciting and dangerous sport, undertaken at the hazard of the hunter's life. The danger was not so much from the bison, which rarely turn on their assailants, but from the likelihood of being thrown from one's mount in the mad charge where neither horse nor rider could see the ground ahead with its irregularities, its badger holes, and its prairie-dog towns. The Indians rode wild ponies, trained for the hunt. These were the fleetest animals of the plains and easily brought the hunters alongside the game, which were dispatched with arrows or spears. The pony was obliged to take an active part in the chase, for, as can be seen in the picture, it was ridden without bridle and with only a lasso tied to its lower jaw and trailing on the ground behind so that the rider might regain his mount if thrown. With the advent of firearms even more skill was required than for the bow and arrow, but the slaughter was more sure and rapid. When the breech-loading revolver came into use, "running buffalo" became a factor in their extermination

A "SURROUND" BY MINNETAREES ON THE UPPER MISSOURI

From a painting in the National Museum, Washington, by Catlin, 1832

On the plains where timber was scarce and a pen or corral could not readily be built, the Indians employed the "surround" for wholesale slaughter, stampeding the bison from all sides simultaneously. Around the eddying mass of bewildered animals the hunters galloped and dispatched their victims with spear and arrow. Now and then an infuriated bull might charge his assailant, or horse and rider be entangled in the mêlée, the latter escaping only by his agility, but on the whole it was not very dangerous hunting. Catlin witnessed the hunt pictured here on the upper Missouri in 1832. The battle resulted in the total destruction of the herd in the space of fifteen minutes. Of the animals which plunged off on the prairie and escaped many were overtaken and killed, while the others returned of their own accord to rejoin their comrades of the doomed herd. The Indians were as prodigal as the white hunters of their great natural food supply and far more meat was left for the wolves than was carried away. In earlier days on the southern and western range the "surround" was effected by a ring of fire on the prairie, followed up by the hunters on foot

IN PURSUIT OF THE HERD

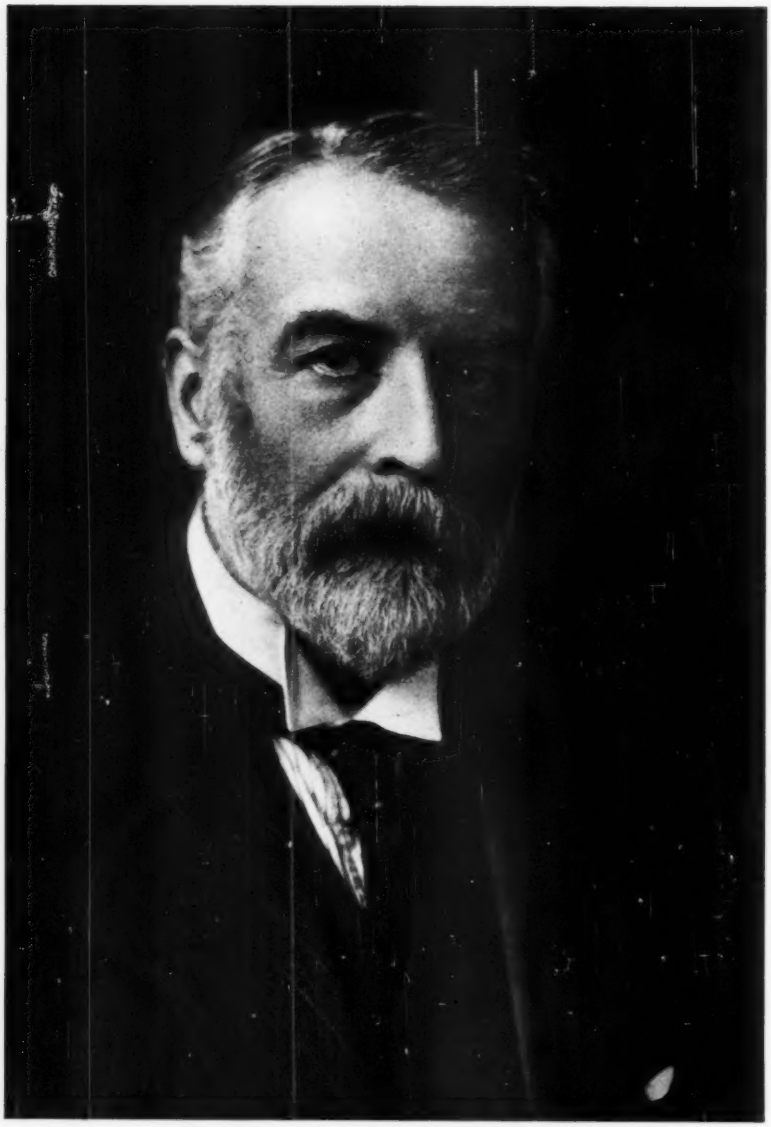
From a painting (damaged by fire) in the National Museum, Washington, by James M. Stanley, 1842–52

For the Indian the hunt was a display of prowess next to war, and accordingly the number of animals he could kill became the paramount object—rather than provision for his family needs. Among other causes of the rapid extermination of the bison was the fact that, during the earlier years of the systematic slaughter, only cows were extensively killed, either for robes or meat. Hunting was correspondingly dangerous, however, for the cows were the swiftest runners and led the herd so that the hunters were obliged to penetrate the rear phalanx of bulls, an undertaking by no means unattended with serious risk. In fact one of the greatest dangers of the hunt lay in the possibility of getting caught in front of an onrush of bulls

WHERE THE MILLIONS HAVE GONE

From a painting in the National Museum, Washington, by J. H. Moser, 1888

The black, unskinned heads of the dead bison, in striking contrast with their bones ultimately bleached white, gave a ghastly appearance to the slaughter grounds of the bison. The bison were killed by the Indians only to obtain choice cuts of meat, especially tongues, and to a lesser extent for the pelts and other products; by the white men they were killed for robes and saddles of beef, while the main part of the animal was left by all hunters for wolves and vultures, or wind and sun. The miles of bones eventually gave rise to a traffic which became remunerative as there grew up a demand for phosphate for fertilizers and bone black for refining sugar. In 1874 the Santa Fe Railroad alone shipped nearly seven million pounds of bones which brought as much as $18 a ton crushed. The white hunters who finally exterminated the bison were an unprepossessing lot and led hard lives with little to reward them. Their hunting required no skill because of the stupidity of the animals, and the prices for either meat or robes were excessively low so that the canvas-clad begrimed followers of the herds were anything but the hunters of our storybooks



G. A. Boulenger
Aug. 1919.

All American zoölogists pay tribute to the work of Dr. George Albert Boulenger and voice thanks for the fundamental assistance that his work has been to them. He has been in charge of the collections of amphibians and reptiles, department of zoölogy, in the British Museum, since 1882, and besides a constant yearly output of technical papers in English and French scientific journals, he is author of works on African fresh-water fishes in four volumes and on the world's reptiles and amphibians in nine volumes. He is associate, corresponding, or honorary member of most of the great scientific societies of the world, and by his indefatigable personal effort in scientific research he has brought honor to the British Museum for all time

Boulenger, the Man and His Work

By THOMAS BARBOUR

Associate Curator of Reptiles and Amphibians, Museum of Comparative Zoölogy, Harvard College

BOULENGER—what charming memories may be awakened by a name! Unfailing candor, erudition, courtesy, a simple dignity, a flaming love for Belgium of his birth and for England the land of his adoption, a son wounded at Gallipoli yet who paused later during the horrors of the campaign on the Euphrates to send his father specimens of a favorite genus. Yes, these and many more were the natural flashes of impression which this photograph caused when first I had the pleasure of seeing it. It recalled delightful chats and visits, amazement at the wealth of treasures in his care, and cups of tea before a cheery blaze.

To be more matter of fact, however, Dr. George Albert Boulenger has had opportunity, by which he has richly profited, to become entirely familiar with most of the fishes, amphibians, and reptiles in the world; probably more familiar than anyone who has ever lived. While the common British custom of not fixing types and of not drawing up descriptions from specifically indicated specimens rather grieves students in this country—yet Dr. Boulenger's writings have been more widely used and of more general service than those of any predecessor or contemporary.

Proud to be numbered among the systematists in a day when many seeking an easier highway to recognition speak of them with scorn, he has fared afield as well, and his contributions to our knowledge of the habits especially of the European amphibians are well worthy of careful study as examples of painstaking observation, well recorded, and then left entirely unadvertised. They stand in dignified contrast to some of the capitalized "new discoveries" we oft have dinned into our patient if somewhat skeptical ears, though happily not by American herpetologists.

The Honorable Position of Naturalist

By G. CLYDE FISHER

Associate Curator of the Department of Public Education, American Museum

THE greatly famed village of Selborne, England, looks much today as it did a century and a half ago when Gilbert White was humble curate, naturalist, and fellow citizen there. Today, as then, it has a single street, picturesque and straggling, set in "lovely landscapes and beechen groves," and everywhere inviting footpaths. Here a path leads across a pasture, through a wicket gate, meandering on beneath the shade of bosky trees, and through undergrowth tangled with dog-rose and meadow-sweet. Yonder on the right hand of the village street footpaths cross the village green, the "Plestor," with its central sycamore tree, still the focus of village life on summer evenings; and here, most wonderful, a footpath zigzags up a steep beech-grown hillside, the "Hanger," curving back and forth upon itself until it reaches the summit and stops at a great "Wishing Stone." And in the "Outlet" back of Gilbert White's house are many interlacing footpaths which lead about garden, hedge, and meadow.

Gilbert White gave to Selborne village the fame it bears. What he did unusual was to hold a great and true sympathy with nature, in consequence of which he was led to observe, through very many years until he was sure of his facts, and to describe, simply and truthfully, the wild flowers, insects, birds, and many other living things of the fields about his native village. He wandered daily through the footpaths of his "Outlet" and the byways of Selborne; he made new paths and planted new trees; with his brother's help he built the steep "Zigzag," and placed the "Wishing Stone." Finally, in the *Natural History of Selborne,* he described the countryside in a way so simple and alluring that everyone who read saw Selborne with its walks and loved it.

Gilbert White is very much the type of naturalist we need throughout America today. The importance of the position of naturalist has been enhanced by the war in a new valuation set on all original investigation along scientific lines. Any man, if he be a sincere student in natural history, will be more or less a leader in his locality—a leader in study, appreciation, and protection of local birds, of wild flowers or of insects, of woodlands, of scenic beauty.

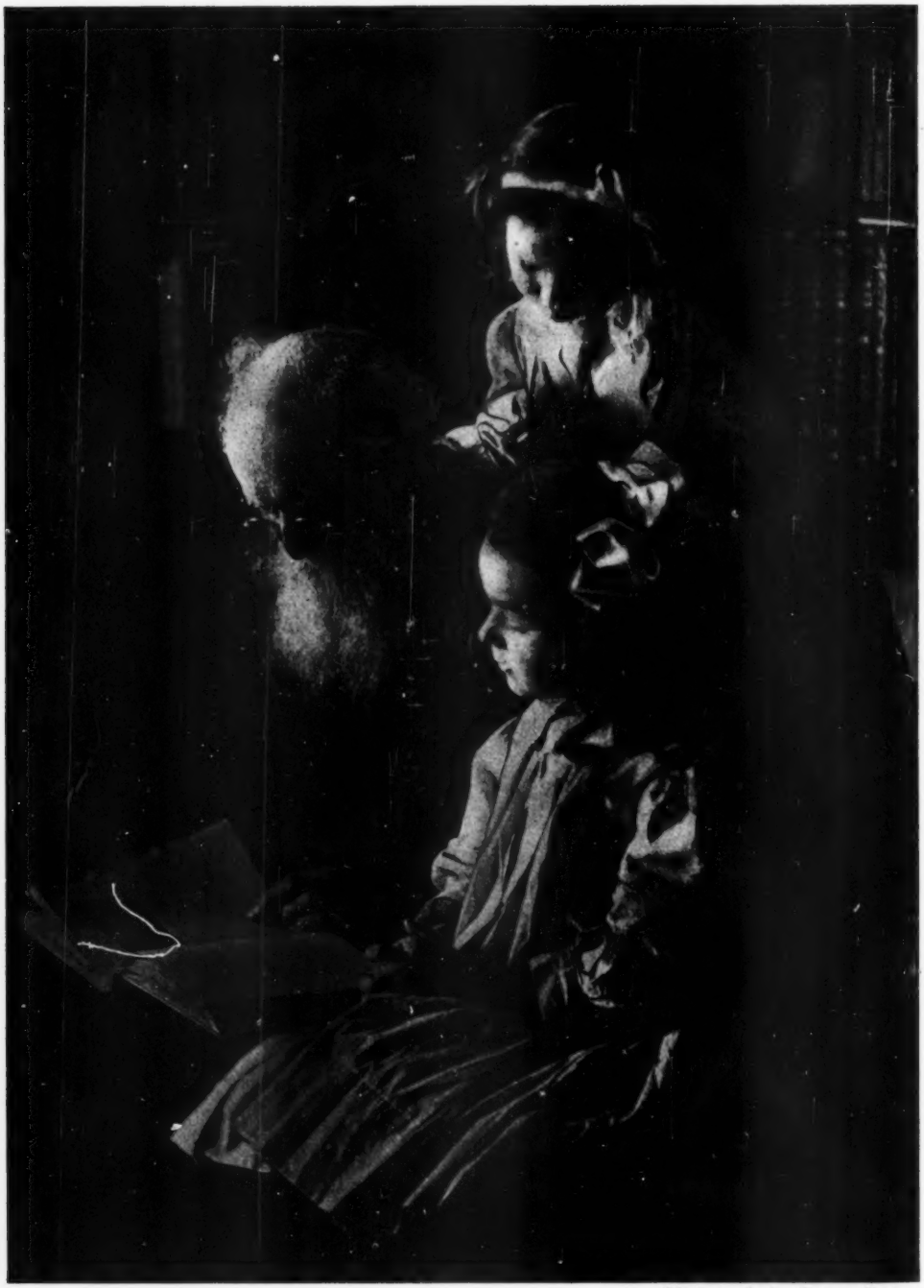
There is in Selborne a suggestion for each village of America. If we walk in the country is it not most often in the middle of the dusty or muddy roadway? Even in New England how often are there paths along the edges of fields where the stone wall is covered with bittersweet and clematis and the chipmunk wanders and the bobwhite calls, or across the meadow where the bobolink starts up from the grass, or across pasture land, through the wood lot, around the hill, along the river—or anywhere except where dread business takes us? We have no smallest chance to get close eye views of the world of wonderful small life forms that call our countryside their home.

I venture that one great step toward developing a love and knowledge of nature in America would be to make and open up inviting paths over and through the farm land for the use of members of one's family and for friends; and, for the use of all in the community, similar footpaths and byways about the environs of the village. Even the most weary will return again and again to the refreshment of a shaded path to some vantage point of view or rest, and it is by such frequent and leisurely wandering over the same way, until it is as familiar as the house, the garden, or the village street, that we come to know and appreciate the abundant wild life about us.

Photograph by Frank M. Chapman

THE HOME OF GILBERT WHITE'S "NATURAL HISTORY OF SELBORNE," 1788

Photographed in the summer of 1919 from the beech-wood hill known as the "Hanger," the most beautiful feature of the countryside, remaining unchanged from the eighteenth century until today. Selborne village and countryside, Hampshire County, England, will remain famous as long as the story of English literature is told, for here was written a book, through a long period of twenty years, which was so delightfully readable and so filled with interesting and true observations that it soon gained an assured fame and has since been listed with such classics as Bacon's *Essays*, Defoe's *Robinson Crusoe*, Walton's *The Compleat Angler*, and Bunyan's *Pilgrim's Progress*



Photograph by Laura Mackay

BOOKS AND NATURE

First-hand observation of the living world—of birds and flowers, trees and rocks—can be supplemented from early years with what others have seen and thought, or with historic incidents in which these objects have played some interesting part. Thus, enjoyment of life is manifolded in an association of knowledge of nature, literature, and history. Burroughs rates high "the pleasure of knowledge."

The work of John Burroughs, our American nature essayist, representing sympathy with all phases of country life, has become an influence for good in America through its entrance into the school life of children. Children like Burroughs' plant and animal stories, and as various teachers have explained, city children especially are benefited by the gentle influences of this literature from the woods and hills

The Love of Nature[1]

CONTEMPLATION OF THE BEAUTY AND INCIDENT OF THE NATURAL WORLD BRINGS RENEWED STRENGTH TO THE MIND

By T. D. A. COCKERELL

Professor of Zoölogy, University of Colorado

AMID the disorderly chaos of human affairs even the most vigorous become weary in time and long for some refuge where the mind may relax and renew its strength. For the tired muscles comes the benediction of sleep; but sleep, as we know too well, does not mend a sorrowful heart or relieve the anxious mind. There can be no doubt that William Morris was right when he described our activities as normally governed by two moods, which he called the moods of energy and of idleness. In the mood of energy we must be doing something, or at least pretending to do something; but in the mood of idleness the mind wanders over pictures of the past, or contemplates that which is beautiful or interesting. The major purpose of art, as distinguished from the obviously utilitarian, is to render the period of contemplation pleasant and fruitful. Thus it may be rescued from mere inanity on the one hand, and corruption on the other.

Morris was lecturing on the aims of art when he put forward this theory, but he was also keenly alive to natural beauty and incident, as his writings abundantly show. Powers of observation and description are combined in these charming lines from *The Earthly Paradise:*

"They left the house, and, following up the stream,
In the low sun saw the kingfisher gleam
'Twixt bank and alder, and the grebe steal out
From the high sedge, and, in his restless doubt,
Dive down, and rise to see what men were there;
They saw the swallow chase high up in air
The circling gnats; the shaded dusky pool
Broke by the splashing chub; . . .
They watched the poppies burn across the grass,
And o'er the bindweed's bells the brown bee pass
Still murmuring of his gains. . . ."

Morris had little use for modern science, and might even have been a trifle impatient if we had criticized the last line, on the ground that it was certainly a *female* bee. Mr. Burroughs is more scientific and less poetical, yet he tells us: "In my excursions into nature, science plays a part, but not the leading part; it is like a silent monitor and friend who speaks when spoken to. Or I may say that I carry it in the back of my head and only now and then in the front. I do not go forth as an ornithologist taking note of the birds, nor as a botanist taking note of the flowers, nor as a zoölogist studying the wild creatures, nor as a biologist, peeping and prying into the mysteries of life, but as a nature-lover pure and simple, who gathers much through sympathy and observation."

The English naturalist Wallace kept a beautiful garden in the latter years of his life for pure relaxation and en-

[1] John Burroughs, *Field and Study*. Houghton Mifflin Company, 1919.
With previously unpublished portraits of John Burroughs, the American naturalist and author, and scenes from his favorite haunts; followed by a series of bird photographs of unusual distinction published in his honor. In connection with the illustrations it is especially a pleasure to be able to quote through the courtesy of the publishers, Houghton Mifflin Company, various brief passages from the writings of Burroughs.—THE EDITOR.

joyment, not for scientific experiments. He was working to the last, but the flowers were for what Morris called the periods of idleness. Happy the man who at ninety years of age, after a life of fruitful labor, can still enjoy nature with the simplicity of a child! Contrary to the imagination of some, science is in no sense inimical to this faculty, and it would be easy to recall many scientific men who retained it unimpaired. Even Herbert Spencer found his moment of maximum enjoyment in the contemplation of a beautiful landscape, with the accidental accompaniment of music.

In the case of our nature writers, whatever may have been their original attitude, the problem of art is necessarily in the background. Mr. Burroughs, when he walks in the woods, cannot altogether forget that he is a reporter. He tries to forget it, and would if possible communicate his feelings to others by some process of telepathy: ". . . I try to get language out of the way as far as possible, and to put my mind directly to that of my reader. Hence, when I have been told that my page does not seem like writing, that it offers no resistance, and so on, I feel highly complimented. I would have it fit the mind as water fits the hand. Deliver me from language as such, from fine phrases; in short, from conscious style."

It is this simplicity and directness in Mr. Burroughs' writings that constitute their charm. He is a friendly companion, keen-minded but not too remote from the ordinary level of mankind. He brings us no astounding revelations, but introduces us to the good company all around us. For some he quickens pleasurable memories, for others reveals a new world. He writes, it would seem, for those who may see the things that he has seen; his book is a species of guidebook, not literature independent of time or place. He is even chary of his words, and does not tell us so much about the woodchuck or the warbler that we can form a clear picture of the creatures, never having seen them. Those who read Burroughs, never having lived in the northeastern United States, will wish that the publishers had introduced a series of pictures of the *dramatis personæ*. Yet, as he himself well says, literature cannot be merely photographic. When we make literature or art out of things, ". . . we must invest them with a feeling, an atmosphere, that the literal fact cannot give; we must work some magic upon the facts."

The question is, how much magic, how much of the human element, how much of that element personal and peculiar to the writer? Says Mr. Burroughs, ". . . Burns's 'Mouse' is a real mouse, but not the one you catch in a trap; and Shakespeare's violets—where do they grow save in the magic page of Shakespeare?" Poets throughout the centuries have employed the worn images of antiquity, things once real and immediate; now chosen rather for their accumulated content of human emotion, like the "blessed word Mesopotamia."

No doubt the highest art is that which is most completely humanized, which expresses most perfectly vital human emotions, connected usually with periods of activity and with the interplay of personalities. It catches the flood of human passions at its height, and preserves for us images of the maximum products of heart and brain. Hence it is often relatively independent of external circumstances, appealing to the facts of nature within rather than without the man.

Nature writing cannot be all this, and must not be it, if it is to serve its true purpose. One hesitates to declare that its humbler objects are the more vital to our needs, but who can contemplate modern life and not perceive the necessity for more healthy

simple objectivity, more restful contemplation of beauty and incident?

It is an interesting question, how much of the love of nature as shown in the observations of any mature mind is simple and naïve. I had, when a child, a delight in bright colors which I no longer possess in its original simple form. The blue of the sky, the red of the rose, produced an intensely pleasurable sensation which had no relation to previous knowledge or experience. With the years, one necessarily loses his simplicity. Even the unfamiliar reminds us of something; hence the American "robin," which is no robin, and "primrose," which is not a primrose.

This brings us the question: should we cultivate the association of ideas in the young, or leave them to weave unconsciously a web of thought around every familiar object? Certainly, it is possible to go too far in cultivating association—to hide the real thing under a mass of the débris of the ages, things which have accidentally stuck to it rather than issued from it. One recalls the occasion when Lord Brougham and the Duke of Wellington met and chaffed each other in this wise: "My lord," said the Duke, "I used to suppose you would be remembered as a statesman, but now I know that you will go down to posterity in the name of a very uncomfortable sort of carriage." "Your grace," replied Brougham, "I once thought you would always be known as the hero of a hundred fights, but it appears that you are to be famous for a cumbersome type of boots!" "Damn the boots," said Wellington, and we rather agree with him. In a certain sense, the United States to the eagle, Scotland to the thistle, Rome to the geese, are all "boots." Yet when I see a species of woodpecker common in this vicinity, I am likely to think, not of the structure and habits of the family of woodpeckers, the Picidæ, but of Lewis and Clark and their ever memorable expedition. It is pleasant and profitable to do so, and I often remind my students of such associations.

Were it possible, however, to develop our ideas of each animal and bird through pure observation we should know and understand it as we do our intimate friends. It is really to the credit of Mr. Burroughs that the animals do not remind him continually of the classical authors or of the poets; or if they do, that he keeps the fact to himself. He tells us what he has seen, and the ideas he associates with each creature are those derived from previous experience with it.

But again, life is short and one cannot learn everything at first hand. Those of us who cannot know nature in detail in this way are glad to see what Mr. Burroughs has seen, in some measure with his eyes. Much of the pleasure of a woodland ramble comes from expectation, and from appreciation of the meaning of what one sees. If a bird is rare, it is well to know it; if it is high in a tree, one likes to know what it would look like close at hand. I know a lady whose eyesight was defective, and to whom a tree was simply a mass of green. When at length she was fitted with glasses, she was greatly astonished to find that it was possible to see the separate leaves. So might one learn to know many animals and birds at a distance, and be surprised to note their finer markings and peculiarities of form when seen close at hand.

The painted lady butterfly (*Pyrameis cardui*) is rare in England, but occasionally visits the country in great numbers from the continent. As a boy in Kent, I had read the interesting life story of this butterfly before there came a certain famous *Pyrameis cardui* year, and I particularly remember my first capture of the species. My hand trembled, and in my enthusiasm I insisted on showing the butterfly to a telegraph boy who came along. The insect was indeed a lovely

thing, but I could not have felt as I did without already knowing what it was and something about it.

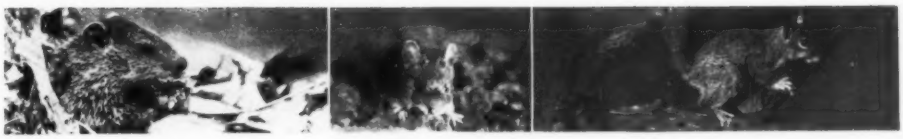
The answer to our question seems to be, that we should teach even young children something about the facts of nature, and the result will be to increase their pleasure and quicken their interest. It is undesirable to leave them to see everything for themselves, for indeed, they usually will not look. In Europe, where there is so much traditional nature lore, children grow up little naturalists; but in many parts of America, where the parents neither know nor care, the children remain ignorant.

More especially, perhaps, should we emphasize those facts which, though vital, could not be appreciated by the mere observation of a single individual. The migrations of birds and the data of geology have been elucidated by many men working at different times and places, and yet the general results can often be stated lucidly in a few words, and readily appreciated in relation to what is actually seen. It is not always easy judiciously to combine book learning and observation; and even Mr. Burroughs, compared with whom most of us are slaves of the book, falls into the error of referring to the "*Halictus* moth," because he had never

Photograph by G. Clyde Fisher

This great stone under the ironwood tree, where John Burroughs played when a boy, lies in pasture land less than a half mile from the house of his birth on the old farm in Delaware County, near Roxbury, in the western Catskills. On this stone he posed for "The Seer," a bronze figure by the late C. S. Pietro (see photograph on page 581).

Burroughs, commenting on the work of the camera, and the value of photographs not only for the accurate delineations of science but also for portraiture of friends and reproduction of scenes linked with personal associations, writes in *Field and Study:* "The camera has no imagination, no sentiment, and no memory, and its literal truth is not art; but for that very reason, it gives us the nude reality. . . . Our own memories and feelings do the rest. . . . Who could paint for me the old homestead with the charm it has in my memory, not changing a single feature, but touching every feature with the pathos with which it haunts me?"



Young woodchuck, jumping mouse, and gray squirrel—friends of Mr. Burroughs about his home on the Hudson

seen the little bees of that genus, which certainly abound in his own garden. On the other hand, Fabre, most marvelous of observers, made a mistake concerning the identity of an insect because he did not sufficiently consult the books, and had to be corrected by his friend Pérez.

We need many nature writers. Not only is the field too great to be covered by a single man in any locality, but every part of the country must have its own observers and writers. We doubtless have in our midst the necessary ability, potentially at least, but it is difficult to stimulate it to production. Unless the work is based on observation, it has small value, and how many can take the time to master the mysteries of nature? The professional scientific man usually works under high pressure, and has little leisure to sit in the woods and watch the procession of events. Many thousands may be true lovers of nature, but as amateurs they cannot prepare themselves to interpret her in literature. A lifetime is short for this, and who can be sure that, even so, he will succeed? It is a high calling, demanding exceptional ability and fidelity. Perhaps public appreciation, coming with the spread of higher education, will eventually smooth the way.

The underlying unity of nature may come to be reflected in the human mind, creating harmonies in place of discord. Out of simple pleasures and reactions may grow a philosophy of life more in harmony with the facts of existence than other more pretentious schemes. Every true naturalist is probably something of a mystic, because he cannot fathom the depths of life, and will not concede that the greater may be completely explained in terms of the less. Yet he increasingly feels the bond which unites all living things, and desires to play his game according to the rules which he perceives to have been established in the dawn of the world. He is not convinced so much by rigid logic, as by a multitude of concordant observations. He comes to trust nature as one trusts a friend. Of him we may write, as we wrote some years ago in Wallace's *Malay Archipelago:*

The love of nature makes the whole world kin,
To East and West the gospel preached herein
Must stir the soul.
All living things his comrades were, he saw
The harmony which underlies all natural law,
Saw nature whole.

Chipmunk, white-footed mouse, cottontail rabbit, flying squirrel—still other good friends in the fields and woods about Mr. Burroughs' home

"SLABSIDES," BURROUGHS' CABIN IN THE WOODS

"Slabsides" is nearly two miles west of John Burroughs' home, "Riverby," at West Park, Ulster County (on the Hudson, eighty miles north of New York City). Within the cabin one sees partition walls made of yellow birch, a skeleton stairway, and rustic chairs and beds. The late Theodore Roosevelt and many other noted men among Burroughs' friends have visited him here. John Muir was one of his first visitors, in 1897, the year after the cabin was built. At one side of the cabin Burroughs made a garden for celery and other vegetables which demand black rich soil—for in recent geological time the land here had been the bottom of a small lake. When digging into the peaty soil, he found sections of wood which had been gnawed by beavers in days long past

Photograph by G. Clyde Fisher

IN THE GARDEN AT FOURSCORE YEARS

The squash that eventually grew to great size in Burroughs' garden at Woodchuck Lodge on the old homestead farm, and was presented to his friend Thomas A. Edison

But no garden or other matter can hold his attention if he hears a new or unwonted bird song; he hears even faint and distant calls, inaudible for the man of fewer associations with woods sounds. "If we have no associations with these sounds, they will mean very little to us. Their merit as musical performances is very slight." On this matter Burroughs quotes Roosevelt: "Yet I cannot say that either song [meadowlark's or skylark's] would appeal to others as it appeals to me; for to me it comes forever laden with a hundred memories and associations, with the sight of dim hills reddening in the dawn, with the breath of cool morning winds blowing across lonely plains, with the scent of flowers on the sunlit prairie, with the motion of flying horses, with all the strong thrill of eager and buoyant life. . . . I doubt if any man can judge dispassionately the bird songs of his own country; he cannot disassociate them from the sights and sounds of the land that is so dear to him"

Photograph by G. Clyde Fisher

WHERE MAY AND JUNE ADD BIRD SONG TO THE SOUND OF FLOWING WATERS

Each May Burroughs comes to the woodland along these falls on Black Creek, near Slabsides, to look for the Louisiana water thrush and other warblers, for the scarlet tanager and phœbe. Here he often camps and cooks his favorite "brigand" steak.

"The camper-out often finds himself in what seems a distressing predicament to people seated in their snug, well-ordered houses; but there is often satisfaction when things come to their worst,—a satisfaction in seeing what a small matter it is, after all; that one is really neither sugar nor salt, to be afraid of the wet; and that life is just as well worth living beneath a scow or a dugout as beneath the highest and broadest roof in Christendom. . . .

"When one breaks camp in the morning, he turns back again and again to see what he has left. Surely he feels he has forgotten something; what is it? But it is only his own sad thoughts and musings he has left, the fragment of his life he has lived there. . . . Where he hung his coat on the tree, where he slept on the boughs, where he made his coffee or broiled his trout over the coals, where he drank again and again at the little brown pool in the spring run, where he looked long and long up into the whispering branches overhead, he has left what he cannot bring away with him,—the flame and ashes of himself."—From *Pepacton*

MEMORIES

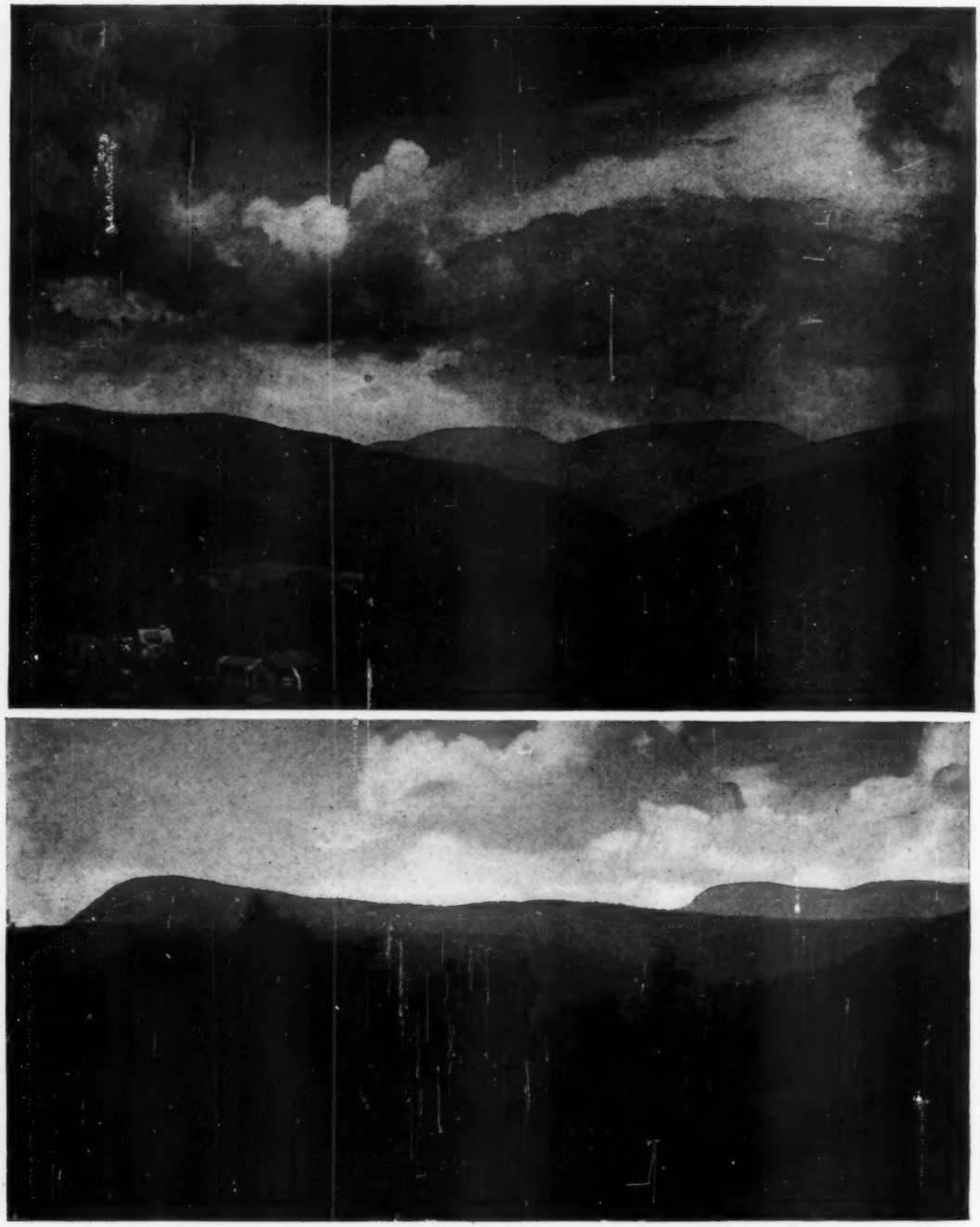
". . . . The voice [of the nuthatch] is that of a child, soft, confiding. . . . His call in the spring woods when we made maple sugar in my boyhood—'yank, yank, yank'—how it comes back to me! Not a song, but a token—the spirit of the maplewoods finding a voice."

"How distinctly I remember where our schoolboy path through the woods crossed an old brush fence, and in winter the fresh prints in the snow of the feet of the red and gray squirrels to whom the old fence served as a highway. How vivid the picture of it all is in my memory! The delicate tracks of the wood mice here and there beside our path—they are

Photograph by G. Clyde Fisher

Photograph by G. Clyde Fisher

still unfaded in my mind, after a lapse of more than seventy years. . . . The wild life around us becomes interesting the moment one gets into the current of it and sees its characteristics and by-play. The search for the elements of the interesting in nature and in life, in persons and in things—well, is an interesting search."—From *Field and Study*. (The fireplace is built of native rock from the vicinity of Burroughs' home. From this little red schoolhouse he went to Cooperstown Seminary.)



IN THE SOUTHERN CATSKILLS

Photographs by G. Clyde Fisher

Mr. Burroughs has written various chapters of charming description of the Catskills. "The Heart of the Southern Catskills," in the volume which he calls *Riverby*, is a delightful invitation to the mountains and valleys he portrays. No quotation can carry the spirit of it; one must read the whole thirty pages,—seeing with him the wide sweep of view from Wittenberg (the mountain top at the left in the lower photograph), sleeping the night on the moss under ba'sam boughs; following the trail down into the wonderful Woodland Valley (upper photograph) with its fine trout brook, its sweet seclusion; watching the change from the summer fruit of shadbush and wild strawberry to springtime flowers during the difficult climb of Slide Mountain (at the right in the lower photograph).

"In any such view [from Slide Mountain, 4000 feet elevation] the wild, the aboriginal, the geographical greatly predominate. The works of man dwindle, and the original features of the huge globe come out. Every single object or point is dwarfed; the valley of the Hudson is only a wrinkle in the earth's surface. You discover with a feeling of surprise that the great thing is the earth itself, which stretches away on every hand so far beyond your ken. —From *Riverby*

Courtesy of Toledo Museum of Art

JOHN BURROUGHS

"I never tire of contemplating the earth as it swims through space. As I near the time when I know these contemplations must cease, it is more and more in my thoughts—its beauty, its meaning, and the grandeur of the voyage we are making on its surface. The imaginary and hoped-for other world occupies my thoughts very little. There is so much to know here, so much to enjoy, so much to engage every faculty of the mind and develop every power of the body, such beauty, such sublimity, and such a veil of enchantment and mystery over all—how can one ever tire of it, or wish for a better. I am in love with the earth."—From *Field and Study*.

This portrait of John Burroughs was modeled by the late C. S. Pietro, and is the property of the Toledo Museum of Art. The rock on which Mr. Burroughs posed is on his old home farm in the western Catskills. A photograph of it is reproduced on page 574

Photograph by J. D. Johnson

IN THE DOORWAY AT SLABSIDES—A BIRD SONG SUGGESTS A TRAIN OF THOUGHT

"The traveler sees little of the Nature that is revealed to the home-stayer. You will find she has made her home where you have made yours, and intimacy with her there becomes easy. Familiarity with things about one should not dull the edge of curiosity or interest. The walk you take today through the fields and woods, or along the river bank, is the walk you should take tomorrow, and next day, and next. What you miss once, you will hit upon next time. The happenings are at intervals and are irregular. The play of Nature has no fixed programme. If she is not at home today, or is in a noncommittal mood, call tomorrow, or next week. It is only when the wild creatures are at home, where their nests or dens are made, that their characteristics come out."—From *Field and Study*

BIRD PHOTOGRAPHS OF UNUSUAL DISTINCTION

THE SERIES ON THE PAGES FOLLOWING, THE WORK OF SOME OF OUR NOTED BIRD PHOTOGRAPHERS AND NATURALISTS, IN MANY PARTS OF THE COUNTRY, IS PUBLISHED IN HONOR OF JOHN BURROUGHS, WITH MANY BRIEF QUOTATIONS FROM HIS WRITINGS

WHERE CAN BE HEARD "THE WHISTLE OF RETURNING BIRDS"

"I do not know a bird till I have heard its voice . . . A bird's song contains a clew to its life, and establishes a sympathy and understanding . . . "—From *Wake-Robin.*

"One sees the passing bird procession in his own grounds and neighborhood without pausing to think that in every man's grounds and in every neighborhood throughout the State, and throughout a long, broad belt of states, about several millions of homes, and over several millions of farms, the same flood-tide of bird-life is creeping and eddying or sweeping over the land. . . . Think of the myriads of dooryards where the 'chippies' are just arriving; of the blooming orchards where the passing many-colored warblers are eagerly inspecting the buds and leaves; of the woods where the oven-birds and water-thrushes are searching out their old haunts; of the secluded bushy fields and tangles where the chewinks, the brown thrashers, the chats, the catbirds, are once more preparing to begin life anew—think of all this and more, and we may get some idea of the extent and importance of our bird-life. . . .

"The birds . . . are always the same familiar birds, the birds of our youth, but they are new as the flowers are new, as the spring and summer are new, as each morning is new. Like Nature herself they are endowed with immortal youth . . ."—From *Field and Study*

Photograph by Leslie W. Lee

THE BROWN THRASHER—IN NEW ENGLAND

"People who have not made friends with the birds do not know how much they miss. . . . The only time I saw Thomas Carlyle, I remember his relating that in his earlier days he was sent on a journey to a distant town on some business that gave him much bother and vexation, and that on his way back home, forlorn and dejected, he suddenly heard the larks singing all about him,—soaring and singing, just as they did about his father's fields, and it comforted him and cheered him up amazingly. . . .

"There is something almost pathetic in the fact that the birds remain forever the same. You grow old, your friends die or move to distant lands, events sweep on, and all things are changed. Yet there in your garden or orchard are the birds of your boyhood. . . . The call of the high-holes, the whistle of the quail, the strong piercing note of the meadowlark, the drumming of the grouse,—how these sounds ignore the years, and strike on the ear with the melody of that springtime when your world was young, and life was all holiday and romance!"—From *Birds and Poets*

Photograph by Norman McClintock

THE LITTLE GREEN HERON—IN FLORIDA

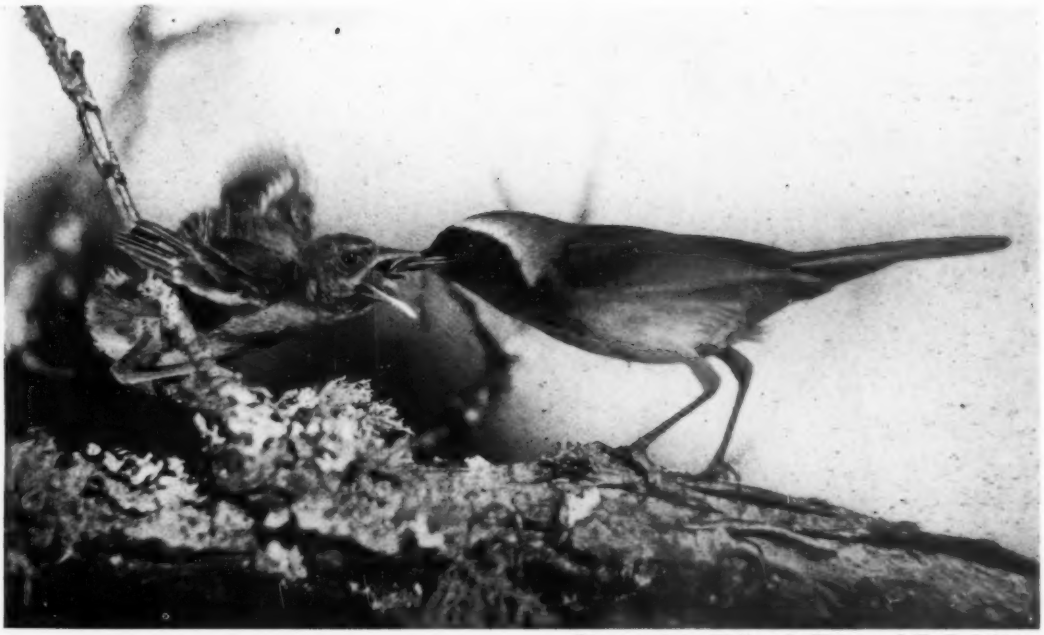
Burroughs identifies himself with nature and looks at it from the standpoint of one in sympathy. He points out again and again in *Field and Study* that each creature in any given bit of country is living its individual independent life, quite irrespective of the life of man and wholly apart from it—each is "a jet of vital activity with a character and purpose of its own"

Photograph by Alvin R. Cahn

IN TEXAS—ONE OF OUR FAMOUS SONG BIRDS A KINSMAN OF THE MOCKING BIRD

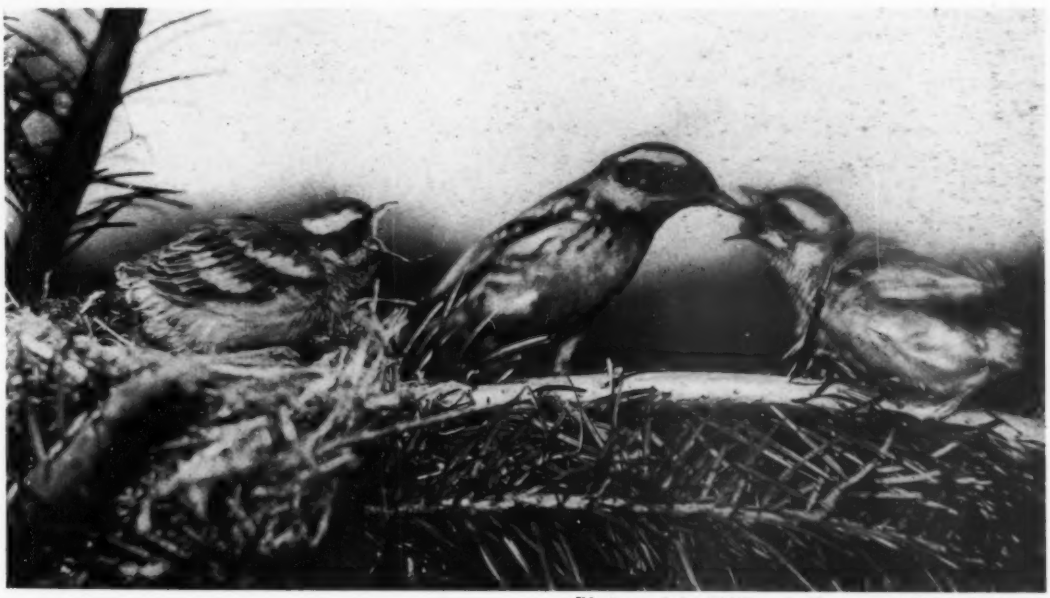
"It might almost be said that the birds are all birds of the poets and of no one else. So true is this that all the great ornithologists . . . have been poets in deed if not in word. Audubon is a notable case in point, who, if he had not the tongue or the pen of the poet, certainly had the eye and ear and heart . . . the singleness of purpose, the enthusiasm, the unworldliness, the love, that characterize the true and divine race of bards. So had [Alexander] Wilson, though perhaps not in as large a measure; yet he took fire as only a poet can. While making a journey on foot to Philadelphia, shortly after landing in this country, he caught sight of the red-headed woodpecker flitting among the trees . . . and it so kindled his enthusiasm that his life was devoted to the pursuit of the birds from that day. . . . The very idea of a bird is a symbol and a suggestion to the poet. A bird seems to be at the top of the scale, so vehement and intense is his life,—large-brained, large-lunged, hot, ecstatic, his frame charged with buoyancy and his heart with songs."

—From *Birds and Poets*



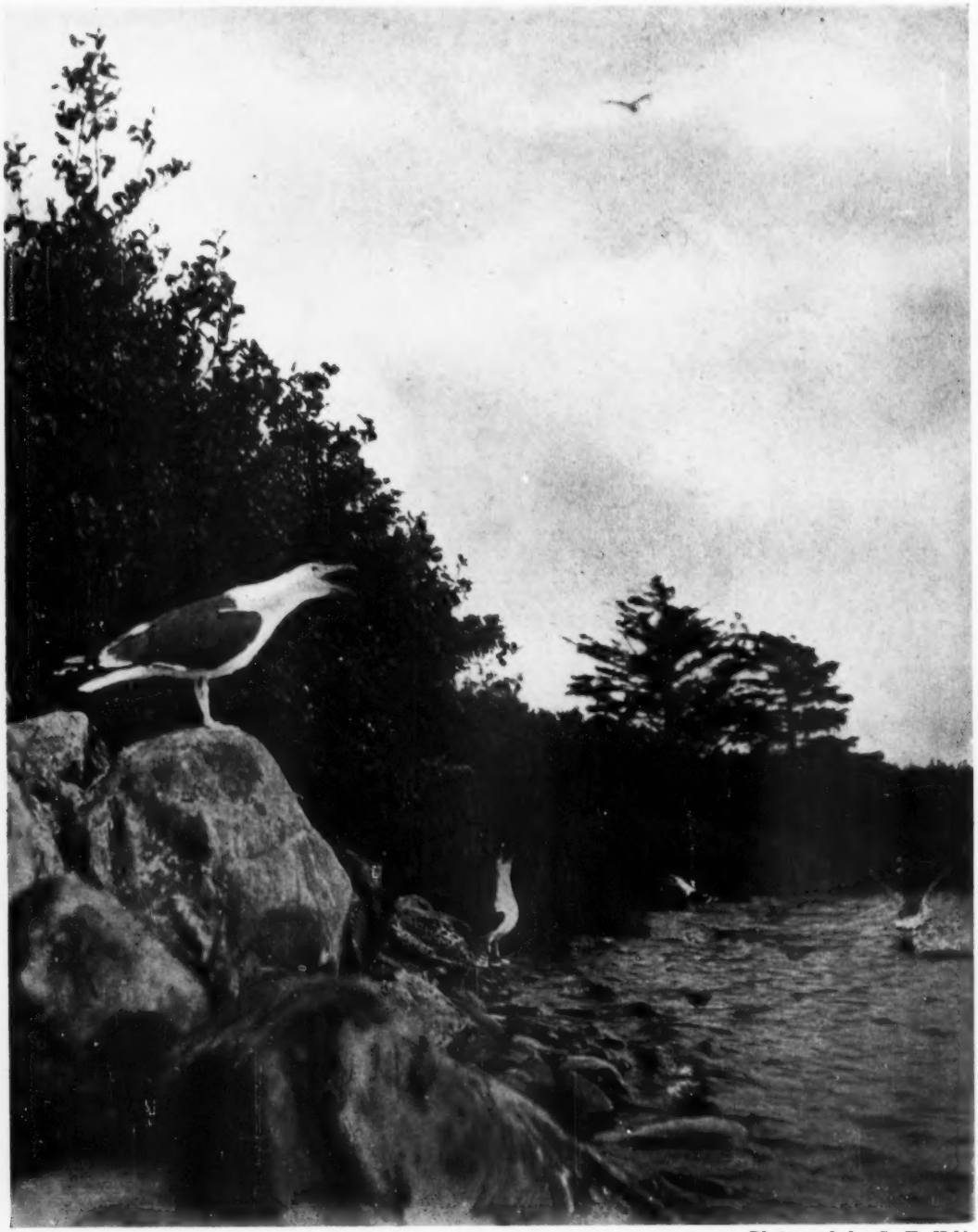
Photograph by William L. Finley and H. T. Bohlman

Pacific yellow-throat—in Oregon.—"The current notion that the parent birds teach the young to fly—that of set purpose they give them lessons in flying—is entirely erroneous. The young fly automatically when the time comes, as truly so as the witch hazel nut explodes, and the pod of the jewel-weed goes off when the seeds are ripe. The parent birds call to their young, and I have thought that in some cases they withhold the food longer than usual to stimulate the young to make the great adventure . . ."—From *Field and Study*



Photograph by William L. Finley and H. T. Bohlman

Black-throated gray warbler—Oregon.—"Till the middle of July there is a general equilibrium; the tide stands poised. . . . But as the harvest ripens beneath the long hot days, the melody gradually ceases. The young are out of the nest and must be cared for, and the molting season is at hand. After the cricket has commenced to drone his monotonous refrain beneath your window, you will not, till another season, hear the wood thrush in all his matchless eloquence. The bobolink has become careworn and fretful. . . . Some of the sparrows still sing, and occasionally across the hot fields, from a tall tree in the edge of the forest, comes the rich note of the scarlet tanager."—From *Wake-Robin*



Photograph by G. K. Nobl

GREAT BLACK-BACKED GULLS ON A LAKE OF NOVA SCOTIA

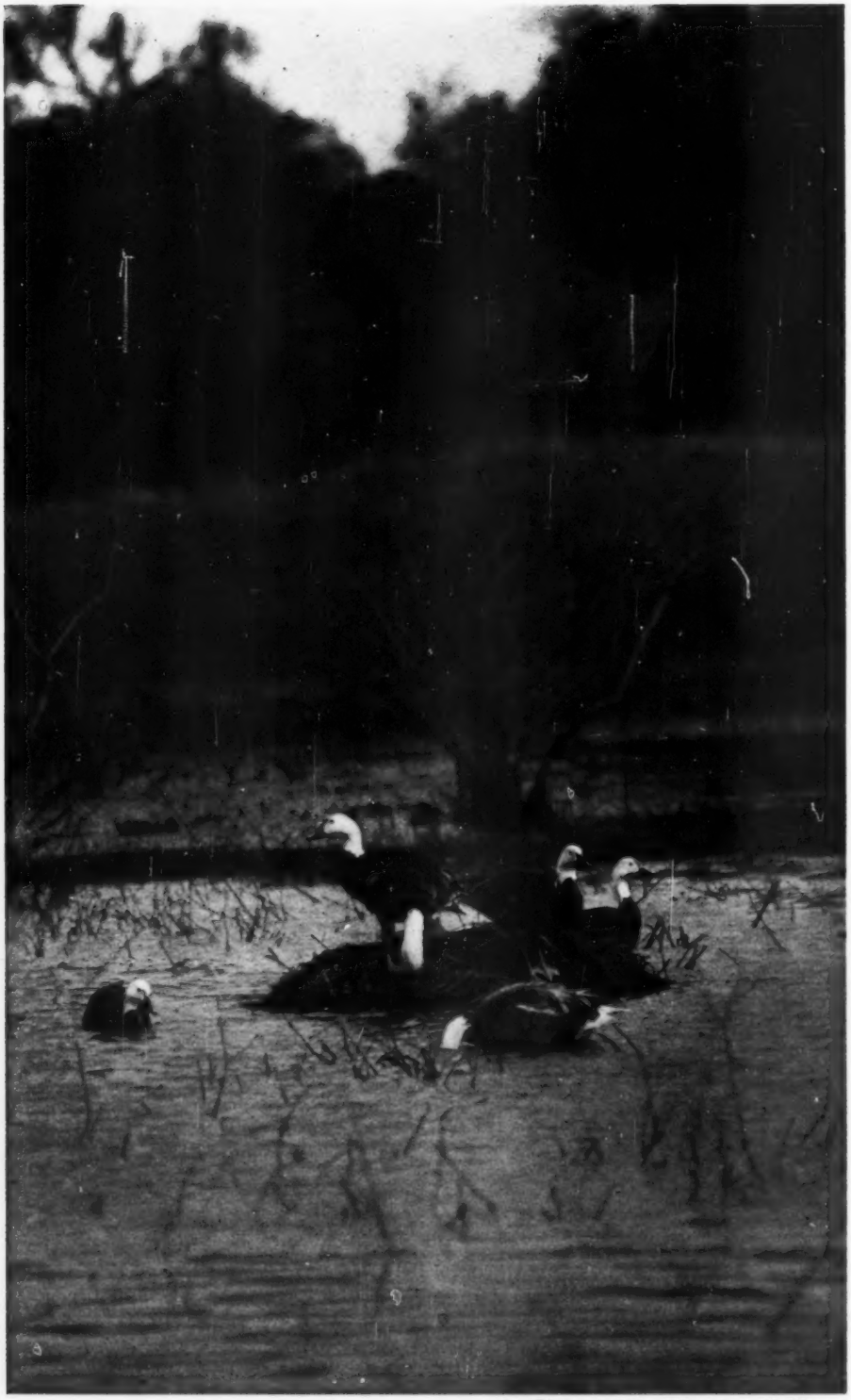
This species is the most majestic of the Atlantic Coast gulls in the winter time. It is a silent, alert sentinel of un inhabited beaches, never seeking the protection offered by civilization nor the ready sources of food about the fish ing village. A glimpse into the summer colony, however, gives a very different idea of these shy winter visitors

Photographs by William L. Finley and H. T. Bohlman

INHABITANTS OF INLAND WATERS

The western grebe (above), and a young avocet, of the Malheur marshes.—Malheur Lake, Oregon, with its surrounding marshes, was set aside in 1908 as a federal wild bird reservation by special proclamation of President Roosevelt. It is the greatest wild bird reservation in the United States, but is about to be destroyed by promoters shutting off all water from entering the lake[1]

[1] EDITORIAL NOTE.—In letters to the Editor Mr. Finley calls attention to the destruction in prospect for this and Klamath Lake reservations: "I do not know whether you have any way of helping us in regard to Klamath and Malheur Lake reservations. Lower Klamath Lake where Dr. [Frank M.] Chapman got his great habitat group for the American Museum, is now dried up and the reservation is practically destroyed from the bird standpoint—unless the United States Reclamation Service opens the dykes along Klamath River and lets the water back in. We have a continual fight against this sort of commercialism that wants to destroy everything in the hope of turning it into money." (See page 736)



Photograph by Edward A. McIlhenny

THE BLUE GOOSE IN ITS WINTER HOME—THE LOUISIANA MARSHES

Photograph by Frank Overton

THE MARSH HAWK ON LONG ISLAND, PHOTOGRAPHED RISING FROM ITS NEST

Photograph by William L. Finley and H. T. Bohlman

The California condor (adult) in southern California.—Several hundred photographs were taken, showing the life history of the California condor. Eight different trips were made back into the mountains to the nest. The old birds became tamer at each visit until, on the last trip, they were photographed at a distance of only a few feet

Photograph by William L. Finley and H. T. Bohlman

We recall John Burroughs' characterization of the late Theodore Roosevelt as an observer "in preëminent degree." He says apropos this power: "You may know the true observer, not by the big things he sees, but by the little things; and then not by the things he sees with effort and premeditation, but by the quick, spontaneous action of his mind"

Photographs by Arthur A. Allen

STUDIES IN NATURE'S EBONY—IN NEW YORK STATE

Bronze grackles have been accused of doing damage in the cornfield, but they feed on cutworms and other insects in summer, and this particular bird, while under observation at arm's length from a blind, fed its young upon grasshoppers.—"The great thing in observation is not to be influenced by our preconceived notions, or by what we want to be true, or by our fears, hopes, or any personal element, and to see the thing just as it is. A person who believes in ghosts and apparitions cannot be depended upon to investigate an alleged phenomenon of this sort. . . . Above all don't jump to conclusions. . . . Be sure the crow is pulling corn instead of probing for grubs, before you kill him."—From *Riverby*

Today State Conservation Commissions, aiming to keep extant our native races of game birds and to introduce others like the pheasants, are giving the crow an unsavory reputation so far as unselfish respect for the rights of others is concerned. Burroughs is evidently aware of this objectionable feature in the crow but likes him withal; he gives many a bit of virile character description of him: "The crow is always in the public eye or ear. His color gives him away, his voice gives him away; on the earth or in the sky he is seen and heard afar. No creature wants his flesh, no lady wants his plume, though a more perfect and brilliant ebony cannot be found in nature. He is a bit of the night . . . yet the open day is his passion, publicity his passion. He is a spy, a policeman, a thief, a good fellow, a loyal friend, an alarmist, a socialist, all in one . . . he is never disgruntled, come rain, come shine, come heat, come snow. . . ."—From *Field and Study*

Photograph by Edward A. McIlhenny

MALLARDS REARED IN NORTHERN NESTS FIND WINTER REFUGE AT THE SOUTH

From the social gathering in lake and pond they rise, toward the close of day, and fly with incredible speed, scattering in small bands, to their feeding grounds in marsh or rice field.

"The ways of nature,—who can map them, or fathom them, or interpret them, or do much more than read a hint correctly here and there? Of one thing we may be pretty certain, namely, that the ways of wild creatures may be studied in our human ways, inasmuch as the latter are an evolution from the former, till we come to the ethical code, to altruism and self-sacrifice."—Burroughs in *Ways of Nature*

Photograph by Edward A. McIlhenny

MALLARDS FEEDING—IN LOUISIANA

With heads submerged they search the marsh bottom. After their migration to the North to nest, ducks will return in the fall to a given pond at the South, if this pond be protected and if something of the wild surroundings of the accustomed natural environment be provided. In the beginning a few wing-clipped ducks can be made a start for the colony, other ducks will join, and by suitable attention to their needs the colony will grow. After a return the first fall the success of the colony is assured. This is a method for conservation of our wild fowl that will be increasingly practised in the years immediately ahead

Photograph by Edward A. McIlhenny

AT THE SOUTH IN WINTER TIME—OUR AMERICAN ROBIN

"We never know the precise time the birds leave us in the fall: they do not go suddenly; their departure is like that of an army of occupation in no hurry to be off; they keep going and going, and we hardly know when the last straggler is gone." (From *Pepacton.*) A few individual robins remain in sheltered spots in the North.

In comparison with English song birds it is said that ours are fewer in number and less famous as musicians. Burroughs says: "Our birds are more withdrawn than the English," with "notes more plaintive and intermittent." The robin comes very near the head of the list of well-known American bird musicians, in the family with the thrushes and bluebird, and sharing the honors with the family of mocking bird, brown thrasher, and catbird. He is one of the greatest sources of cheer and companionship in city or country. It is therefore all the more pity that spring after spring the number returning to the North has been smaller and smaller, owing to destruction of the migrating flocks at the South,—robins shot in thousands for food

Photograph by Ernest Harold Baynes

At the North in winter time, just chickadee.—A view within the window

Photograph by Ernest Harold Baynes

A view without.—"If you would study the winter birds . . . you can bring them to your own door—chickadees, nuthatches, downy woodpeckers, brown creepers . . . little waifs from the winter woods that daily or hourly seek the bounty you prepare for them . . . The woods and groves seem as barren as deserts, the earth is piled with snow, the trees snap with the cold . . . the wonder is that . . . these little adventurers can subsist at all. . . . How much company they are to me! What thoughts and associations they bring!"—From *Field and Study*

Freeman Art Co., Eureka, Humboldt County, California

THE HERITAGE OF AMERICANS

The northern redwood forests are a heritage for every American—yet all are in the hands of private capital. We must purchase sections of this redwood land from the lumber companies who own them, at once before everything has been leveled by the ax and fire. For these forests are the greatest the earth has ever seen in all the millions of years of its history. The trees tower into the sky between three and four hundred feet and attain a prodigious thickness of trunk; and so ancient are they that the largest of them have seen the passing of more than four thousand generations of men

Freeman Art Co., Eureka, Humboldt County, California

The contrast!—Hundreds of thousands of acres of redwoods in California have been cut in the last sixty years. Each sawmill is a center of incalculable loss not only through the timber removed but especially through waste and fire

Sequoia—the Auld Lang Syne of Trees

AN IMMEDIATE WORK FOR EVERY LOVER OF AMERICA IS THE PRESERVATION OF THE REMNANTS OF REDWOOD FORESTS IN NORTHERN CALIFORNIA

By HENRY FAIRFIELD OSBORN

President of the American Museum of Natural History, Member of the Council of the Save the Redwoods League

IT was said pithily by John Muir that any fool can destroy trees; they cannot run away from him, and if they could they would still be chased and hunted to their death—as long as fun or a dollar could be got out of them. Speaking of the Sequoias, he contrasted the ability of the Creator to protect their race, as he has done, through millions of years from drought, disease, avalanches, tempests, and floods, with the inability of that same divine power to protect them even for a generation from fools—"only Uncle Sam can do that."

If the American Museum, by some magic of power, could hope for large influence in conservation matters, it would vote to save these Sequoia woodlands. Their venerable and colossal splendor is a heritage for the future America. Many of these trees have lifted their heads to the sunshine of more than a thousand summers, and the largest of them have outlived the passing of four thousand generations of men. Mere matter-of-fact and commercial consideration, moreover, entirely apart from any sentiment regarding their beauty or their age,

should save them: "in the name of thrift, and foresight, and love of country"—as Roosevelt would have said.

The destruction has progressed far, and has been especially augmented of late. The most majestic among the manifestations of life on the globe are being cut for—breathe not aloud the uses to which they are being put, lest the recorders of human history laugh! Sequoias towering more than three hundred feet into the sky are being brought to the ground for grape stakes for the vineyards of California; for shingles and railroad ties for the temporary convenience of a mankind which is slow to evolve beyond aims of immediate personal gain.

Do we ask why the burden of saving the redwood forests falls so immediately on the shoulders of the state and national governments—outside of the general reason that state and national governments should look out for the welfare of the people? Uncle Sam owned all this western timber country—yet Uncle Sam was so desirous of giving every man in the free United States his chance, that millions of acres of timber land were sold at two and one half dollars an acre when just one individual tree of the wide-stretching forests was worth at the lowest figure one hundred dollars. Thus the timber went into the hands of private and corporation capital—and "nothing could be done about the crazy bargain!"—at least the sales could not be undone.

This was the condition when Muir wrote these words in 1900, and the twenty years since that time have seen the ranks of the redwoods pushed farther and farther back from the sea, by lumbering methods involving frightful waste. Some solution of the problem must now be sought which will return to the government as large a part of the redwood lands left as money for purchase can be found, to remain permanent possessions of the American people.

One of two courses we shall follow. Either we shall now, at a goodly expenditure of money, save the redwood forests as they stand, or we shall lose them, and after a few years, at an exceedingly greater expenditure of money, try to save a few small mutilated tracts which may be left, knowing that we have doomed the redwood as a race to an eternal extinction. We recognize the second course as that usually consummated in the forest policy of any new community. Have we not learned the lesson of loss, especially in the East, so that we can apply the principle to the redwood? We all realize that we long ago passed the day when we could afford to look upon trees as giant weeds to be got rid of by any method, as our forefathers in America looked upon them, or even as inexhaustible gifts of Heaven to be managed wastefully. They are one of the few vital assets of the country. If we have not learned the lesson, we shall in this particular instance not merely burden our children with the bond issues of an attempted restoration of what we have destroyed, we shall lose the redwoods beyond all possibility of restoration. For in the case of trees such as white pine, black walnut, and others now nearly exterminated, we have not been dealing with species that take half a thousand years to reach maturity and two or three times that to attain their greatest nobility of size. One hundred years has been more nearly the maximum—and that has seemed too long to the man who lives for himself only and for today.

The species of Sequoias are only two,[1] the big tree (*Sequoia gigantea*) and the redwood (*Sequoia sempervi-*

[1] The genus *Sequoia* is not closely related to any other living group of trees, but in former geological times, reaching back as far as the Jurassic and Trias, near relatives of our Sequoias were common, with many species scattered widely over the northern lands of the globe. Their fossil remains have been discovered in Europe and in various lands bordering the Arctic seas—Siberia, Spitzbergen, Greenland, Canada, and Alaska. The big tree and the redwood are therefore representatives of a family whose existence with small variation must be measured in millions of years—they are "the auld lang syne of trees."

rens). If we journey southward through the warm interior valley of California, on our left hand tower the snow-capped Sierra Nevada Mountains. These bear in their high altitudes on the seaward slopes the big trees. They are heroic in size. Mixed with other conifers in open groves, they stand massive and battered like ruins from an age when life was measured not by single revolutions of the earth around the sun but by thousands and tens of thousands. Fortunately, this species of Sequoia is protected by its very inaccessibility, from five to eight thousand feet up the mountain slopes.[1]

On the right hand as we journey southward through California is the low verdant Coast Range (one thousand to two thousand feet elevation); and over its seaward slopes and in its wide moist valleys are the remnants of the forests of the redwoods. But a very few years ago they reached from north of the California and Oregon boundary line southward in an unbroken belt of forty miles maximum width, to the southern boundary of Mendocino County, California, then on farther south in isolated small forests as far as the Bay of Monterey—a total distance of nearly five hundred miles, twice the north and south lap of the big trees in the Sierras.

These redwoods show striking adaptation to the depth of soil and amount of moisture. On the steep slopes where the soil is shallow, they do not attain a height of more than 225 feet, with greatest diameter of trunk ten feet, and here they grow in open stands more or less mixed with other trees (especially red fir). At increasingly low altitudes and consequent greater depth and moisture of soil the redwoods increase in size and predominate the forest more and more until they form close, crowded stands unmixed with other trees. On flats and in the bottoms of valleys where rivers cut their way through the Coast Range to the Pacific, they make giant redwood fastnesses, many of the trees reaching well above three hundred feet, frequently with a diameter of trunk from sixteen to eighteen feet.

Many of us have entered these greatest forests of the world, in our own northern California. "Architecturally" they consist of long curving aisles between the giant columns of the trees, sometimes with spacious vistas opening to the sea; and the ground and the dark fluted trunks are patterned with shifting mosaics of sun and shadow. For long ages they have stood here in the face of the winter rains that sweep down from the northwest. They have been wrapped about by the moisture-laden summer fog that drifts in from the sea and dips low among the green spires. So great is the moisture among the redwoods of the bottom lands that not only are the trees themselves wonders of growth and verdure, but they are draped with mosses and the ground at their feet is bedded with ferns.

It has been said that this tree, from the standpoint of its timber, is "too good to live," and certainly history has proved it so since the white man discovered its home along the Pacific. The wood has all the qualities to recommend it for the uses of commerce: it is rich in color and takes a beautiful polish, the grain is even and fine, it is firm yet soft and easy to work,[2] it is

[1] This is the Sequoia that has been made world famous by the eloquence of John Muir, whose main work was in the Sierra Nevada Mountains; and it is the great scenic feature of Sequoia National Park—one of the first of our national parks, instituted in 1890, the same year as Yosemite, and the first to be instituted after the Yellowstone in 1872. The greater number of the remaining big tree groves are now under the protection of the National Park Service. On the other hand, the big tree, although it has received so much more attention and protection, is not as great an economic asset for the future as the redwood, particularly because it reproduces only by the slow method of seeding and that with great uncertainty, especially in the northern part of its range.

[2] This refers especially to the redwoods of the bottom lands. The trees of the slopes are likely to have wood less valuable, more "flinty" in character. The "soft" redwood tree is the type which has been so disastrously cut and burned over the coastal flats, until today it represents but a small proportion of the whole redwood area.

Courtesy of Mrs. Edward L. Ayer

In Montgomery Grove above Ukiah.—It is hoped and believed that Mendocino County will buy the Montgomery Grove of redwoods. This would make the town of Ukiah the entrance to the great scenic State Highway through the redwood region. Isolation of the United States during the war has emphasized travel within our own boundaries, while rapid development in the ease of motor touring has added a new possibility to such travel for all. Northern California will now find it to the advantage of the many among its population to save its scenic beauty. Meager profits from redwood lumbering for the few lumbermen among its citizens will no longer be considered adequate return for the present desolation and future poverty of the country

Courtesy of Mrs. Edward L. Ayer

Luxuriance of growth in a redwood stand near Mendocino.—Sonoma County has taken a step in the right direction in purchasing the Armstrong Grove; Humboldt County has very recently bought up the holdings of operating lumbermen along the State Highway; Marin County fortunately has been presented with the Muir Redwoods on Mount Tamalpais, by former Congressman William Kent, of San Francisco; but the world has yet to hear from Mendocino and Del Norte counties that their enthusiasm and patriotism have saved valuable sections of local redwoods

almost fireproof—and in addition to all these good qualities, it is incomparably durable. It is said that trees which have lain five hundred years on the damp ground in the forest have been carried to the mill and made into good lumber.[1]

Do we need to ask if our redwood forests are economically worthy of preservation? Or can we question that they should be removed from individual and corporation interests which must perforce look to an immediate gain in order to realize on investments? Under the ownership of state and national governments, experts in forestry can *keep them forests* while still making them yield a product of timber.[2]

Hundreds of thousands of acres of redwoods have been cut during the last sixty years. San Francisco is largely built of redwood. The whole state is a land of redwood bungalows, paneled and beamed with the choicest grains of the wood,—which is good, except that on an average one half of a tree has been wasted for every one half used, and all the young trees which grew near the mature trees cut have been killed. Especially during the last thirty years, since improved equipment came in, redwood lumbering has proceeded with disastrous speed, and the wood has been used not only for construction and finishing, for shingles and grape stakes, but also for a multitude of other things, among them telegraph and electric light poles, paving blocks, and water tanks. And now recently, because of a scarcity of available timber brought about by the war, the United States Railroad Administration authorized the use of redwood for railroad ties. This, coupled with the building of the roads of the new California State Highway through some of the best of the remaining northern redwoods, started an army of small contractors into lumbering operations, with resulting destruction and waste.

Such was the condition in the early summer of 1919 when Colonel Graves, chief of the United States Bureau of Forestry, and Secretary Houston, of the Department of Agriculture, visited Humboldt and Del Norte counties and impressed upon the people the irreparable loss they were sustaining. It was still the situation in July, 1919, when the "Save the Redwoods League" was organized at San Francisco under the spur of interest of various public-spirited men (see page 605).

The Redwoods League National in Scope

The Redwoods League has the support of the national and state governments, and is national in scope.[3] Although its Council is made up mainly of influential men from California, it includes also prominent representatives from the East.

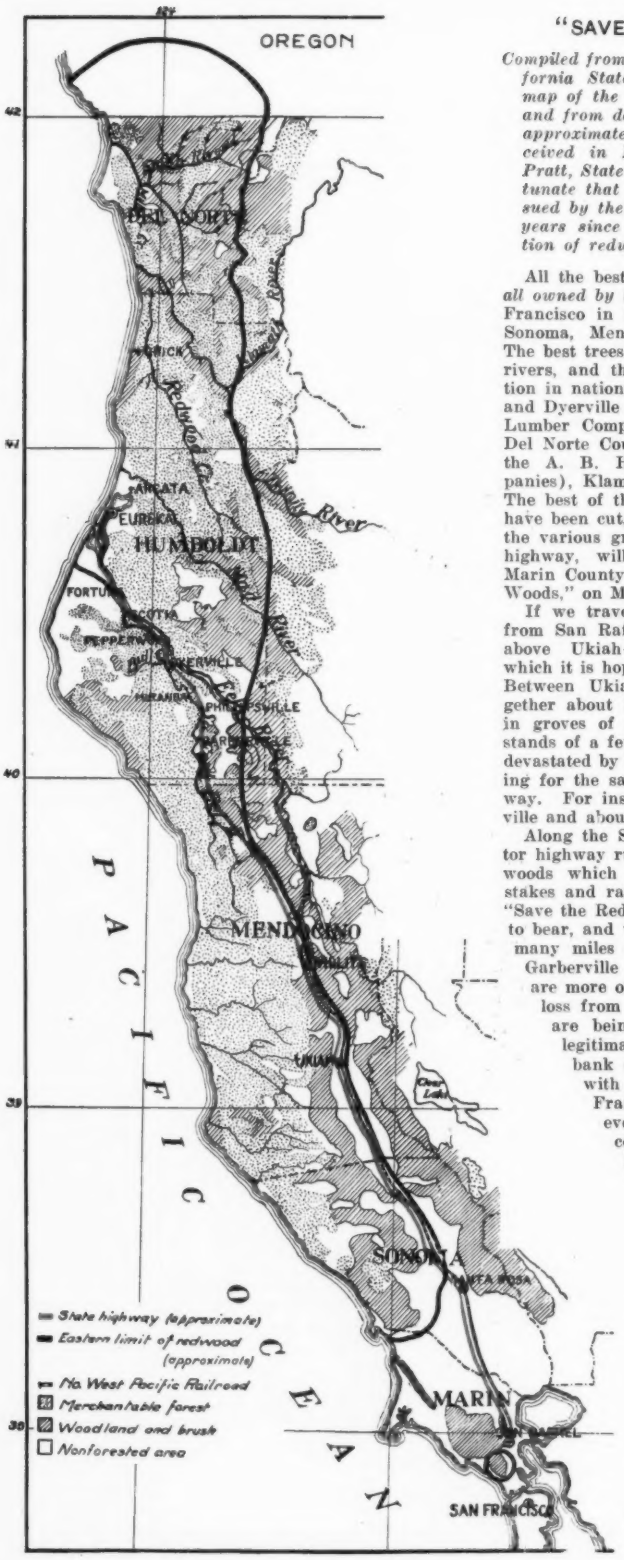
One of the first steps of the League was to call the attention of the United States Railroad Administration to the injury to the California State Highway by the cutting of railroad ties along its margin. At once the Administration issued an order that no ties should be purchased from areas which would come within the proposed reservations, or

[1] Bureau of Forestry, *Bulletin* No. 38, "A Study of the Redwood," 1903.

[2] That this can be done is largely owing to the fact that the redwood is an active dominant type of tree although of such ancient lineage. It sprouts vigorously from the stumps when cut, soon forming great circles of tall young trees. Circles of mature trees with the central stump no longer in existence are found in the primeval forest, indicating that this has been the method of growth. It is probable that, if the redwood lands can come under government ownership, such second-growth forest with proper management can be made to supply a large part of the demand for redwood timber, and the primeval forests be left undisturbed, except as certain trees may need to be removed for the health of the others.

[3] The story of the work and aims of the Redwoods League and of the survey of the northern redwoods which was made under its auspices is told by Mr. Madison Grant, a member of the Council of the League, in the September issue of the *Zoological Society Bulletin* of New York—an article which carries the interest and conviction of authoritative knowledge.

Many of the facts in the accompanying statement of the situation of the various groves and forests and of the plans for their conservation are taken from the typewritten Official Report of the Survey made under Mr. Stephen Tyng Mather, director of National Parks, and from Mr. Grant's article.



"SAVE THE REDWOODS" MAP

Compiled from the 1916 geological map of the California State Mining Bureau, the 1911 forest map of the California State Board of Forestry, and from data regarding the state highway and approximate eastern limit of redwoods, received in December, 1919, from Mr. M. B. Pratt, State Forester of California.. It is unfortunate that a 1919 forest map has not been issued by the California Board, because the eight years since 1911 have seen appalling destruction of redwoods, especially bordering the sea

All the best redwoods remaining (and *they are all owned by lumber companies*) are north of San Francisco in the coastal counties of California—Sonoma, Mendocino, Humboldt, and Del Norte. The best trees grow on the bottom lands along the rivers, and those especially adapted for preservation in national or state parks are the Bull Creek and Dyerville stands (owned mainly by the Pacific Lumber Company) in Humboldt County, and in Del Norte County the Redwood Creek (owned by the A. B. Hammond and Sage Lumber Companies), Klamath River, and Smith River stands. The best of the Mendocino and Sonoma redwoods have been cut, some very recently; it is hoped that the various groves left, especially along the motor highway, will be set aside by these counties. Marin County has no redwoods left, except "Muir Woods," on Mount Tamalpais, near San Francisco.

If we travel northward on the State Highway from San Rafael, we find the first redwoods just above Ukiah—the small "Montgomery grove," which it is hoped Mendocino County will purchase. Between Ukiah and Bull Creek there are altogether about 10,000 acres of redwoods, scattered in groves of a few acres with occasional larger stands of a few hundred acres, most of them badly devastated by lumbering and fire but all worth saving for the sake of the attractiveness of the highway. For instance, there are 5 acres at Phillipsville and about 500 acres near Miranda.

Along the South Fork of the Eel River the motor highway runs through some extremely fine redwoods which were rapidly being cut for grape stakes and railroad ties until the influence of the "Save the Redwoods League" was recently brought to bear, and which are still threatened along very many miles of the highway. In fact, between Garberville and Eureka, lumbering operations are more or less in full swing, and the nation's loss from waste and fire in the forests which are being cut about equals the loss from legitimate uses of the timber. The right bank of the Eel River below its junction with the South Fork resembles devastated France, and the devastation is complete everywhere on the left bank also except for one fine stand just beyond Bull Creek, which belongs to the Pacific Lumber Company.

There is need for immediate action if the last of these most ancient and heroic trees are to be saved. Who will dedicate a redwood grove to the health and happiness of the American people? The lumber companies offer every coöperation in selling for such purpose

within four hundred feet of any state highway. This is the federal coöperation we should expect and explains that the situation was not previously understood.

Situation of the Redwood Forests

A survey of the northern redwoods was at once inaugurated by the League, especially with reference to the selection of a suitable area for a national park.

The survey (August 5 to August 10) was made by Mr. Stephen Tyng Mather, director of National Parks, and Mr. Madison Grant, accompanied by Mr. Charles Punchard, landscape engineer of the National Park Service. On the way northward from Ukiah to the junction of the South Fork of the Eel River with its tributary Bull Creek and with the main Eel River, the surveying party passed about ten thousand acres of redwoods (see map). These are in groves of a few acres each with occasional larger stands of a few hundred acres,[1] many of them badly devastated by lumbering, most of them pitiful remnants of the original forests, but all of vast importance from the standpoint of the attractiveness of the highway.

Northward beyond these scattered groves are more nearly solid stands grouped naturally by the drainage of the region into great forests. Prominent are the Bull Creek and Dyerville flats, culminating the northward stretch of the South Fork groves, Bull Creek at the west in the triangle between the South Fork and its tributary Bull Creek, the Dyerville forest at the east in the triangle

[1] It must be understood that one acre of forest even on the most crowded bottom lands means only about three dozen redwoods, 20 inches and more in diameter (known as merchantable timber), with about a dozen additional trees less than 20 inches in diameter. In the mixed forests on the slopes the number of redwoods to the acre may run below 25, inclusive of all sizes.

Officers of the Save the Redwoods League are as follows:

President, FRANKLIN K. LANE, Secretary of the Department of the Interior
Secretary and Treasurer, ROBERT G. SPROUL

COUNCIL OF THE LEAGUE

E. C. BRADLEY
Former Assistant Secretary of the Interior

WILLIAM E. COLBY
Past President of the Sierra Club

GEORGE M. CORNWALL
Publisher, *The Timberman*, Portland, Oregon

WIGGINTON E. CREED
President of the Alumni Association, and Regent, University of California

WILLIAM H. CROCKER
Regent of the University of California, Trustee of the California Academy of Sciences

FRANK S. DAGGETT
Director, Museum of History, Science and Art, Los Angeles, California

JOSEPH D. GRANT
Trustee of Leland Stanford Junior University, Trustee of the California Academy of Sciences

MADISON GRANT
Chairman, New York Zoological Society

HENRY S. GRAVES
Forester, Forest Service, Washington, D. C.

WILLIS L. JEPSON
Professor of Dendrology, University of California

WILLIAM KENT
Donor of Muir Woods, California

STEPHEN TYNG MATHER
Director of National Parks

JOHN C. MERRIAM
President, Pacific Division, American Association for the Advancement of Science

RALPH P. MERRITT
Comptroller, University of California

WALTER MULFORD
Professor of Forestry, University of California

HENRY FAIRFIELD OSBORN
President, American Museum of Natural History, New York

CHARLES F. STERN
State Superintendent of Banks, San Francisco, California

BENJ. IDE WHEELER
President Emeritus, University of California

RAY LYMAN WILBUR
President, Leland Stanford Junior University

CHARLES B. WING
Acting Chairman, State Redwood Park Commission of California

The immediate purposes of the League are stated as follows:

1. To purchase redwood groves by private subscriptions and by county bond issues.
2. To secure a state bond issue to buy the finest redwood groves along state highways.
3. To establish through federal aid a National Redwoods Park.
4. To obtain through state and county aid the protection of timber along the scenic highways now in course of construction throughout California.
5. To encourage the state to purchase cut-over redwood areas for reforestation by natural means, or by replanting where repeated fires have made sprout reproduction impossible.

The fee for annual membership in the League is two dollars. "Membership is an expression of desire to support the plans proposed. It is hoped that through the coöperation of all organizations and individuals definitely giving their interest to this project the purposes of the movement may be realized while it is still possible to secure those ancient groves which now invite protection." Professor John C. Merriam is chairman of the Executive Committee.

Courtesy of Mrs. Edward L. Ayer

IN THE LUXURIANT BULL CREEK FOREST

The hope is strong that the Bull Creek and Dyerville forests can be purchased for a state or national park. But the purchase will have to be accomplished, largely at least, by public subscription and donations of money throughout the United States. And it will have to be done soon, for these redwoods, among the best stands left, are owned by large and active lumber corporations. It is the need for immediate attention that has brought about the organization of the Save the Redwoods League (see pages 603 and 605).

John Muir said more than twenty years ago that large reservations of redwoods should be made in Mendocino and Humboldt counties. The devastation by ax and fire since then has been unbelievably great. Fortunately, however, through the efforts of public-spirited men we have been awakened at the beginning of 1920 instead of a few years hence when it would be too late. Now there are still remnants of forest worth saving

when it would be too late. Now there are still remnants of forest worth saving

Courtesy of Mrs. Edward L. Ayer

IN THE EEL RIVER REDWOODS

No pictures, or words, can convey the attractiveness of the redwood forests. In combination with the majesty of size of the trees are many other features,—there are the fantastic forms of fallen tree trunk and upheaved root, the blending greens in ferns and mosses and tree foliage,—there are sunshine, the living air, the forest fragrance, the sound of wind in the branches,—and if the sea fog is shifting low among the trunks a fine mist falls upon the observer and veils everything in gray

made by the junction of the South Fork and the main Eel. Then in order northward along the coast, the Redwood Creek forest, the Klamath River groves, and, just south of the Oregon boundary, the Smith River groves (see map).

The report of the committee makes it evident that all these forests, or a major part of each, should ultimately be made state or national reservations—national parks or forest reserves. The Smith River tracts are picturesque with old, weirdly shaped trees, and have good camping sites and good fishing. The Redwood Creek stand is similarly picturesque and is especially tropical and fantastic in its luxuriant growths of moss and ferns. In both of these areas the trees are larger and older than elsewhere, less adapted for good timber, and more suitable for park purposes.

Choice for Immediate Reservation

The Survey would direct the first purchase for park purposes either to the Redwood Creek Forest, or to the more southerly Bull Creek and Dyerville stands, connecting with the groves along the South Fork of the Eel River, 20,000 to 25,000 acres altogether. Bull Creek is described as a magnificent stand of about 10,000 acres, belonging in largest part to the Pacific Lumber Company, and the Dyerville forest has about an equal acreage. The Dyerville stand is sharply bounded on the lower right bank of the Eel River by land as devastated as the battle fields of France,—an urgent demand upon the observer to save what remains from a similar desolation. On the lower left bank of the Eel, however, is one of the best stands examined, about 20,000 acres, belonging also to the Pacific Lumber Company and with the new State Highway traversing it,—although it also is bounded beyond by devastated territory. If the great expense of this 20,000-acre tract precludes its purchase in the reservation of Bull Creek, Dyerville, and the South Fork areas, the Survey recommends its addition to these forests at the earliest date possible.

The Money for Purchase

That all these redwood lands are under the ownership of lumber companies means that saving them from the ax will be done only so fast as money can be found for their purchase. The survey committee gives seven suggestions as to ways by which the money may be raised—outside of direct federal appropriation.

1. State taxation
2. County taxation
3. Local taxation
4. Public subscription
5. Donations of money
6. Donations of forest lands within the redwood area
7. Exchange where possible of state or federal forests for private forests within the desired area

Action of the state of California is certain to rescue one or more of the large tracts. That of Dyerville Flat, for instance, is especially threatened at present by the operations of the Pacific Lumber Company.

It cannot be said that the state of California has been wholly indifferent to its redwood forests heretofore. More than twenty years ago $250,000 was appropriated to buy redwood land near Santa Cruz which remains today a state park. On the other hand, the state must be blamed for the unfortunate work of its Highway Commission in failing to get a right of way wide enough to protect the scenic effects along the roadway. In the future the need for the coöperation of a landscape engineer will be understood; also, that the right of way should never average less than three hundred yards. The Commission even went so far in certain areas as to buy only a one-hundred-yard strip of land *with the proviso that the owners remove the timber!*

Anyone who has lived even briefly in California can understand the loyalty of Californians to their homeland—apart from the influence of the great friendliness of its people and its prominent commercial position. Surely they may well ask if there is any sunshine like that which falls on California's valley meadows, and over her warm foothill slopes, and through the mist-draped redwoods against the sky. These things have profound influence even if we are not conscious of it. The public sentiment of the whole state has now been aroused to the danger threatening its northern forests, and Governor Stephens, the Legislature, and the people may be trusted for the result.

Humboldt County Purchases 800 Acres along the State Highway

As to county action there is already, since the formation of the Redwoods League,

a definite story to be told. It is a story of activity on the part of the citizens of Humboldt County, coupled with personal generosity of two members of the League—as well as a spirit of coöperation which included members of the State Highway Commission and all the operating lumbermen. A matter of paramount importance was accomplished in early September when there was stopped all work of lumbermen directly bordering the highway under construction along the South Fork of the Eel River.[1] And now the deeds for the holdings are in the hands of the county. This gives immediate protection, for a part of the distance, to the narrow strip of the forest which contributes so much toward the beauty of the roadway—and also to its popularity through protection from sun and blowing dust.

County action has thus proved itself, and county and local money are certain to accomplish much, but cannot be expected to purchase the great tracts. The area occupied by the redwoods includes relatively small communities of people. It cannot be expected that the local population should carry the heaviest burdens of taxation.

Sonoma County had previously purchased one small grove of redwoods, the Armstrong Grove; and it is hoped that Mendocino County will buy the Montgomery Grove. This is situated just beyond Ukiah, on the west side of the State Highway, and if saved will, together with the town, form the motor tourist entrance to the northern redwood region.

Certain lumbermen among those owning the land have already made gifts to the state and others are certain to do so, but it is scarcely fair that they should be expected to be more generous than the rest of us. It speaks well for these men, who know the forests and their value, that they have already shown themselves willing to coöperate in a manner advantageous to the Government in any transfer of ownership. What the Redwoods League hopes for is not only gifts of redwoods from the owners in the proposed reservations, but, especially, gifts of redwoods owned, or purchased, in other areas, which can be exchanged for sections in the proposed reservations.

[1]There have been many printed reports of the notable meeting held at Eureka, September 6. The small lumbermen who were operating along the Highway, cutting grape stakes and shingles, were brought together, and they agreed to suspend cutting for the sum of $60,000 and to give two-year options on their property. The county gave $30,000 toward the amount, Mr. Mather, $15,000, and Mr. William Kent, $15,000. Mr. Kent had previously proved himself interested in the relation of these trees to the public welfare by presenting to the nation the Muir Woods on Mount Tamalpais.

Let All the Nation Contribute

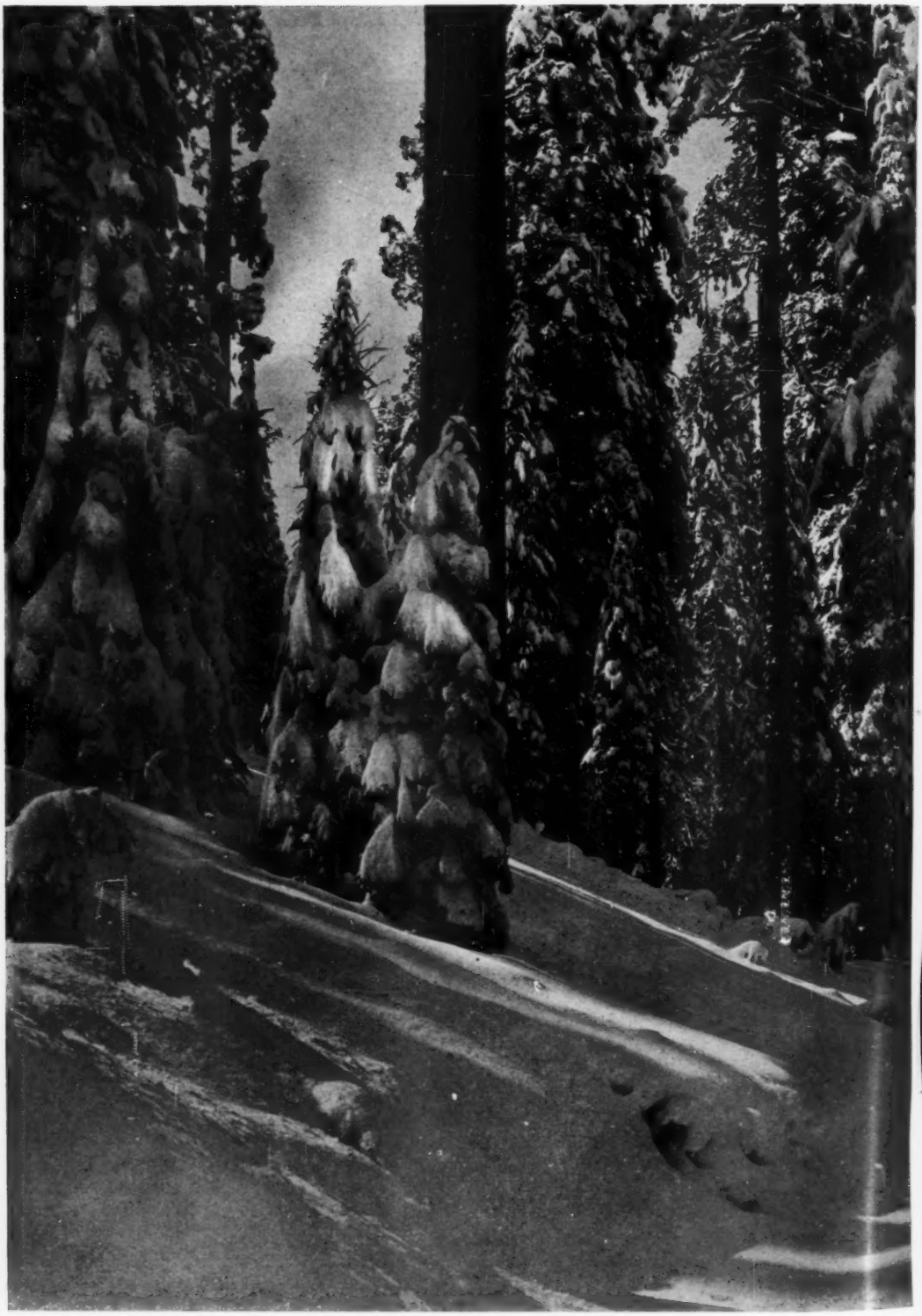
Public subscription and donations of money over the whole United States are among the most hopeful methods for saving the redwoods, and the quickest. But every means must be taken to spread a knowledge of the situation or it will not be possible to catch the thought and heart of the people in the complex condition of national and international affairs today.

All the people of the nation are concerned in the matter. So unique are the redwood forests and so especially fitted for recreational purposes that they should become possessions of all the people, looked upon with a sense of ownership by every American. As brought out in the report on the League's survey, in connection with the large expenditure necessary, "the resultant benefits from the area preserved will be measured in units more valuable than gold or silver—in health, in joy and pleasure from the recreational opportunities afforded, and in pride that we have saved these trees from the ax and the circular saw and that they belong to us and to our children forever."

As to direct federal appropriation, notwithstanding recognition of the need the process will prove a slow one in the present reconstruction period. Uncle Sam has usually designated national parks and forest reserves out of some part of the public domain; redwood conservation, unfortunately, is a case for purchase. Congressman Clarence F. Lea, of California, has presented a resolution to the House of Representatives calling for an investigation of the problem with reference to the establishment of a national redwoods park.

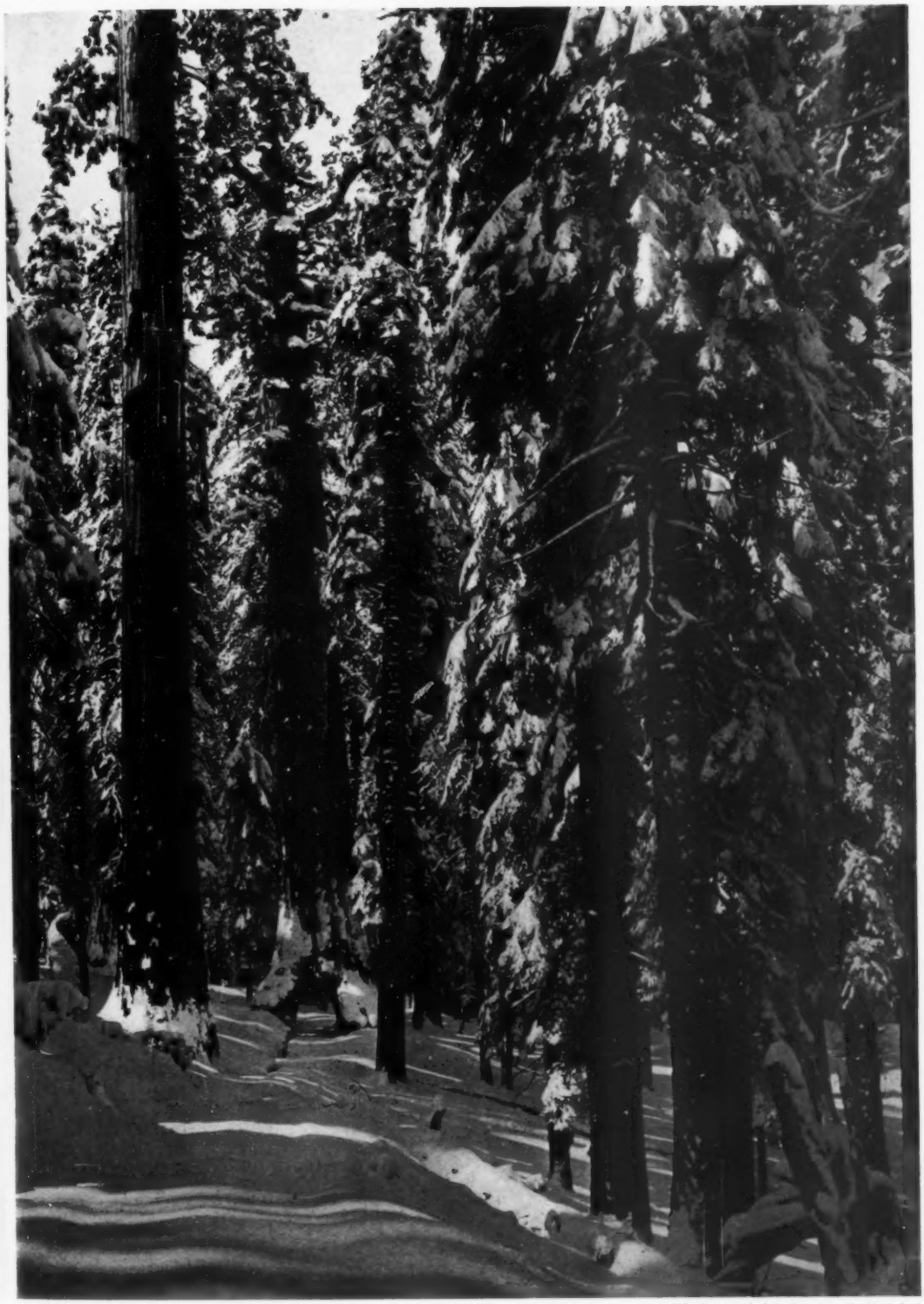
The following relative to federal action is quoted from a recent letter from Colonel Graves, chief of the United States Bureau of Forestry:

"I regard the movement as of very great importance and one which should be backed up by the entire nation. In many ways the redwoods represent the most remarkable forests in the world. They may not be quite as large as the giant trees of the Sierras but, growing as they do in dense continuous



A MAY DAY IN THE SIERRAS AT 5500 FEET ELEVATION

Redwood groves in the low altitudes of the Coast Range are never made inaccessible by heavy snows



Photograph by George J. Reichel

THE DRIVEWAY PASSES THROUGH THE BIG TREE "WAWONA"

Big trees of Mariposa Grove, "Wawona" probably 3000 or 4000 years old, height 227 feet.

stands, there is impressiveness which to me makes them unique among all the forests that I have ever seen.

"This splendid undertaking is going to be possible only through combined action of the Government, the state, and the public at large. As to the contribution of the Federal Government, it is very likely to be delayed and to come as aid to a project in which the state and the citizens of the nation are already liberally contributing."

What will appeal to the country as the thing to do in the necessity of the case is that we, each and all, shall purchase these forests as fast as we can, *for our own,* with money subscribed in small or large amounts; then, that we shall present them to Uncle Sam so that they may remain forever under his protection. This will be a definite recognition of the unitedness of government and people in America, and of the interest and generosity Uncle Sam has always accorded the people in the matter of the country's natural resources.

I am including in this article only photographs of the northern redwoods unmolested by lumbering (with the one exception, page 599). The frightful destruction continues.[1] It is not to be wondered at that the people of the northern coast area who see it going on about them and realize that their prosperity, their very existence commercially, depends on the maintenance of these forests, have awakened to the waste.

But the point is, the country is now awakened, after the many hundreds of thousands of acres are gone, and it is still not too late to save the tens of thousands of acres left. There is now, besides, a definite organization in the Save the Redwoods League to represent the people of the country and to handle money or gifts of land to the best advantage.

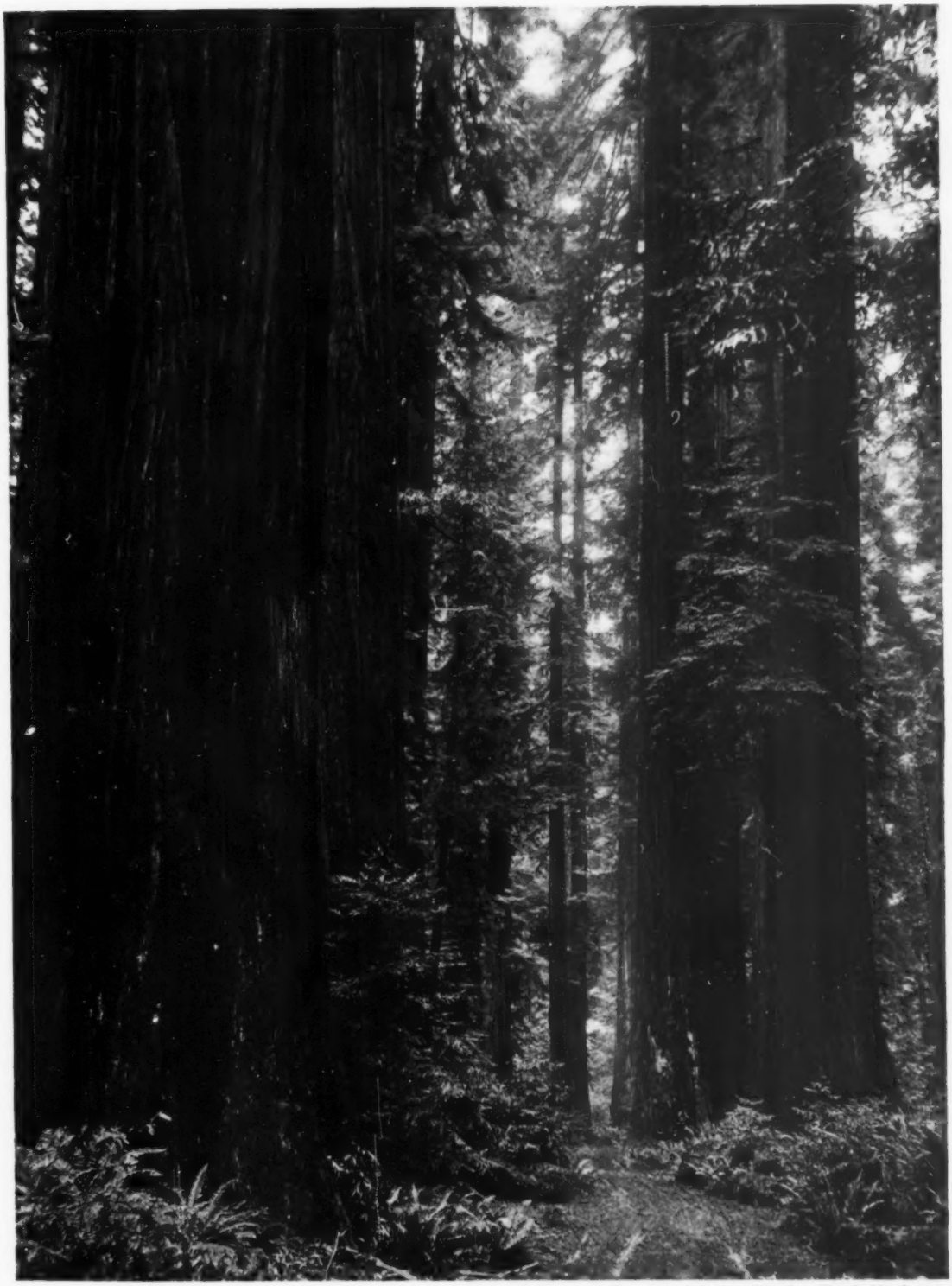
I would put emphasis, therefore, not so much on what is lost, as on what can be saved. There are parts of the northwestern highways where for miles the road is narrowed and blocked with piled grape stakes and shingles, and on either hand the ground is covered with a jumble of treetops, branches, slabs, and bark, which should have gone to the manufacture of some by-product. But also there are stretches where the roadway leads from open sunshine and distant views of green, wooded mountain slopes into the giant forest and on through colonnades of trees where the air is cool and fragrant and long beams of sunlight slant down through the green of redwood foliage.

Nor would I direct the gaze to the miles of desolate country where everything has been leveled and only charred stumps of giant trees mark the site of the forests destroyed. Instead I would bring to the imagination the acres of forests still uncut and the potential joy for Americans of today and tomorrow in their possession.

The war has made the surface of the earth seem smaller and all the lands nearer and the peoples nearer. If France and England and Belgium and Italy seem not far away from America today, how very close to all other parts of the United States is California! To go to the western coast, to tour through these northern forests is no longer the impossible dream for the many. It will be realized by tens of thousands of people in 1920.

The redwoods are not only the "glory of the Coast Range" and the pride of Californians, they are the pride and satisfaction of all Americans. Good luck will surely attend us if we save our Sequoia woodlands.

[1] See many full page illustrations in Mr. Grant's article, *Zoological Society Bulletin*, September, 1919.



Freeman Art Co., Eureka, Humboldt County

CATHEDRAL AISLES—IN HUMBOLDT COUNTY, CALIFORNIA

The sunshine penetrates the roof of green far above and illumines the aisles between the giant pillars, imparting an effect of architectural grandeur. Redwood forests are the planet's vast cathedrals for the spirit of worship of its people. Somehow—American money will dedicate these forest cathedrals to the American people

PHOTOGRAPHS OF LLEWELLYN GLACIER, BRITISH COLUMBIA, WITH FIELD NOTES

BY L. C. READ

PANORAMIC VIEW OF LLEWELLYN GLACIER, SOUTH END OF ATLIN LAKE, BRITISH COLUMBIA

Photographed August 10, 1918, from a point high up on Mussen Mountain, by Mr. L. C. Read, of Atlin. Mr. Read's descriptive notes, made on the occasions of his annual visits to the glacier, are presented under the photographs

Llewellyn is one of the largest glaciers outside the Arctic regions but so remote from routes of travel that it has received little scientific investigation; very few people have even seen it. This panoramic view is a combination of three negatives, showing about thirty by sixty miles of glacial ice nearly all of which is above timber line. Llewellyn Mountain in the distance at the left is about twelve miles away. To the left of this is the Sloko Range, Sloko Lake being at the foot of the heavy snow banks near the top of the range. In the lower left-hand corner may be seen the point where Mussen Mountain extends its forefoot into the ice field.

In the central region can be seen part of the firn or fountain-head of the ice region. The Pacific Ocean, about seventy-five miles away, should be visible from the summit at the center of this view, in clear weather. This whole area is far above timber line and consequently it may be that the ice is very deep in its central portion. The medial moraines (the two dark lines crossing the view) show the trend of the ice movement; they come to within two or three hundred yards of each other, then separate gradually until they are fully ten miles apart at the foot of the glacier.

At the right is seen a giant nunatak or rock-mass, protruding through the glacier, with a fine cirque above two cascading glaciers which assist in bringing rock fragments and heaps of bowlder clay to the medial moraines.

It is supposed that the peaks of the firn are at least two thousand feet above the ice. The scene is so vast that this view gives but a very poor conception of the immense distances and dimensions.

I made the trip to Llewellyn Glacier and up on the south peak of Mussen Mountain in the summer of 1918, thinking that perhaps photographs of the glacier might be of value to students of the movement of glacial ice and medial moraines. Not often, certainly, has a camera stood facing the vast scene.

We made camp at timber line after leaving the ice, and spent the night on the mountain. Shadows of the peaks above and to the west of us slowly crept over the valley of ice, and the sky with its golden sunset colors of the North was particularly impressive. The lonely cry of the whistling marmot and the call of the mother ptarmigan sounded across the gulch, while continually from below could be heard the dull subterranean rumble of the stream under the ice. We saw a mountain goat for a few seconds before the night came, silhouetted against the sky. He stood on the highest crag, a dignified, contemplative figure, looking over the vast expanse of ice and mountain with no one to dispute his ownership. Soon darkness came and we went to sleep listening to the sound of the water beneath the bergs—while Vega, Deneb, and Altair, with the Northern Cross, stood watch overhead

LLEWELLYN MOUNTAIN COVERED WITH CASCADING GLACIERS AND COMPLETELY SURROUNDED BY LLEWELLYN GLACIER

The cascading glaciers on Llewellyn Mountain are very beautiful in the late summer when the snow has melted from their surfaces; this being the north side, the snow and ice melt slowly, while the south side is bare early in the season. In 1916 the whole ground moraine was converted into a quicksand. About the tenth of July there was a river fully a hundred and fifty yards wide where usually there is solid gravel that may be easily traversed. This photograph was taken in June before the waters flooded the moraine to any great extent. The ice front (seen along the middle of the photograph) is about three miles wide at this place. Llewellyn Mountain in the distance is twelve or fifteen miles away. The exceptionally clear atmosphere enabled me to obtain from a distance of several miles detailed views of the cirques, where accumulating snows had constructed "armchairs for the gods"

FROM LLEWELLYN GLACIER LOOKING NORTH

There is abundant evidence of former glacial action high up on the rocky sides of the mountains adjacent to Atlin Lake and far from any ice today. That the flow of the ice then was in the direction of the outlet of the lake seems well established by the tilt of the glacier-worn rocks. Atlin Lake is the logical head of the great Yukon River, and consequently the ice flow must have been to the north in the last glacial period

ICE ARCH ON LLEWELLYN MOUNTAIN

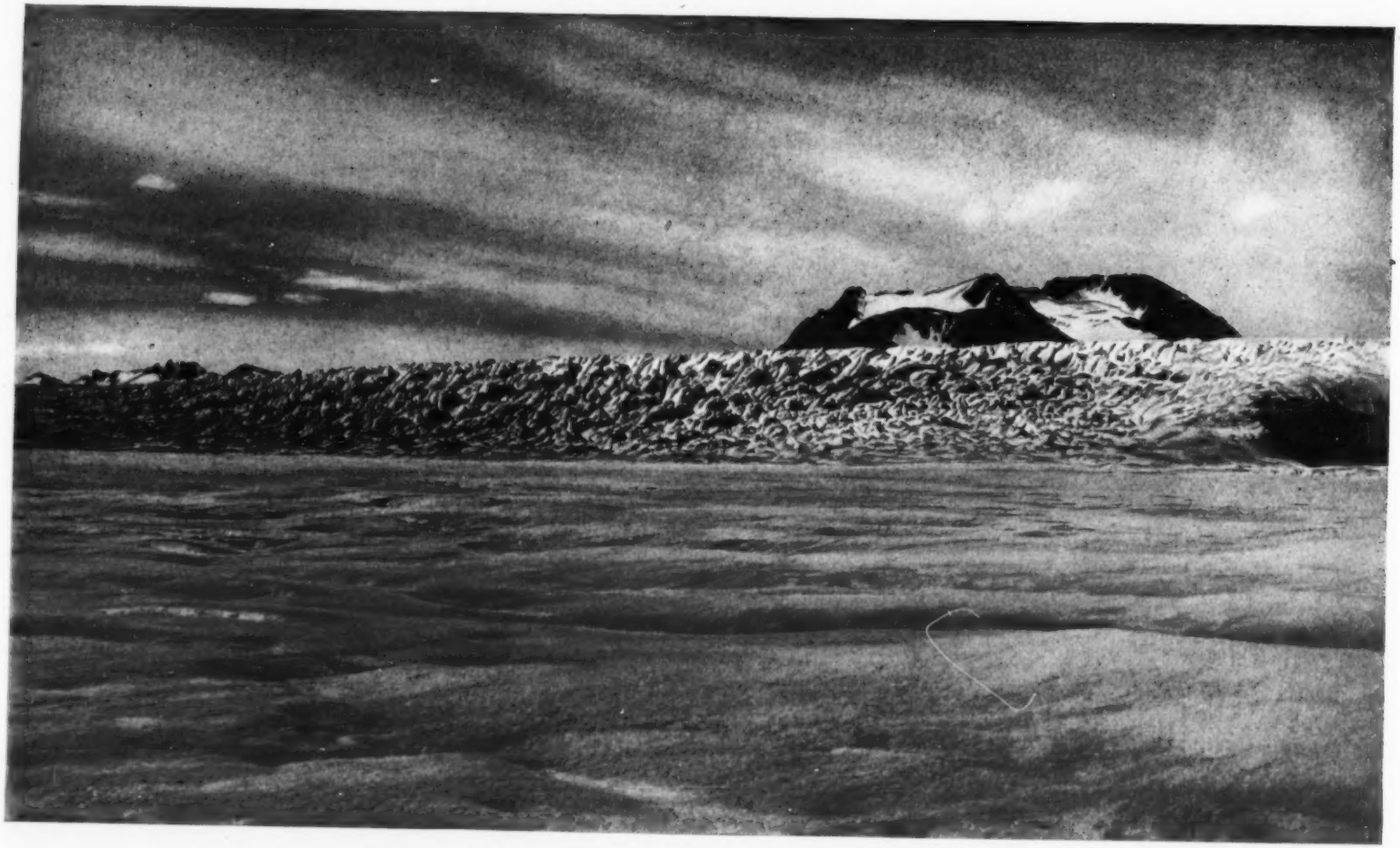
Photographed August 28, 1919, view from the north side

This great body of ice was thrust up on the side of Mussen Mountain by a lateral movement of ice years ago. A small stream from the mountain-side cut a channel through the ice where the arch is now, then took a lower course as the ice receded, leaving the arch to its own destiny. A heavy deposit of morainic material protects the upper part from the action of warm winds and sun but underneath the arch there is no such protection and the space has increased from year to year. For several years I had noted this ice but had no idea of its real nature. I remember seeing, some years ago, a stream of water coming through what must now be the arch, but, being about a half mile away, it was so hidden that I paid no attention to it

LLEWELLYN MOUNTAIN ARCH OF ICE, VIEWED FROM THE SOUTH

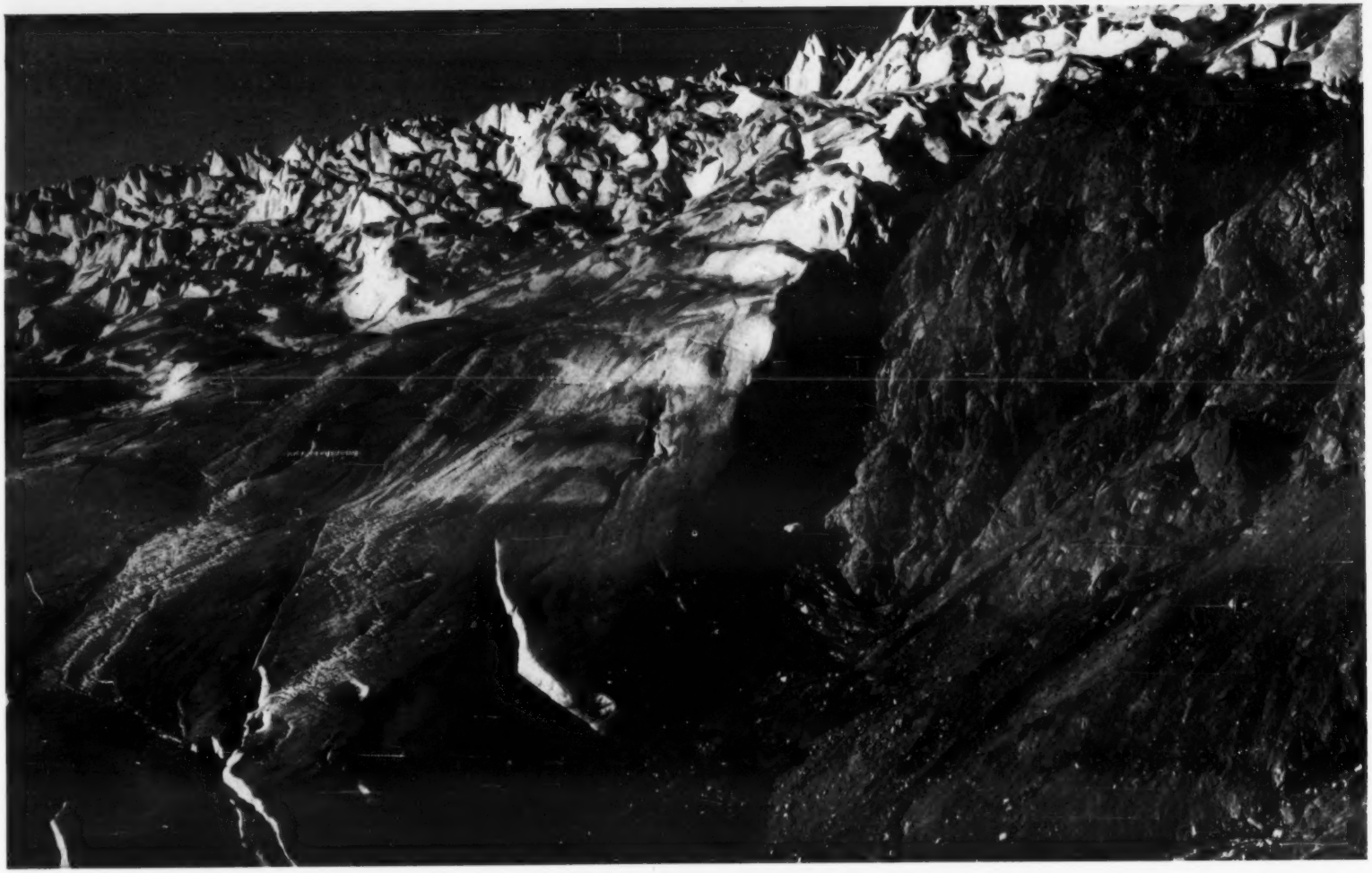
This arch is located about a half mile back from the ground moraine, near the present moat or space between the ice and the mountain-side (see page 620 for detail of moat). The ice evidently has been receding along this moat in the last few years. I am convinced, however, that the rate of flow of this glacier as a whole is slow. The great bed of the glacier does not seem to have advanced or retreated to any considerable extent since my first trip in 1911. I think that one hundred feet would cover all the recession. There is abundant evidence, however, that it has made a great retreat at some recent period, as the willows and alders show that their growth does not extend beyond twenty or twenty-five years. There are no forest trees on the present ground moraine.

The region of alimentation of Llewellyn Glacier is about halfway between the south end of Atlin Lake and Taku Glacier on the Pacific coast, estimated three days' travel by the Indians, seventy-five miles by white prospectors. The ice is continuous from Llewellyn Glacier to Taku Glacier. Llewellyn Glacier evidently ought to be classed as a through-mountain glacier of piedmont type. I cannot ascertain that the earthquake of 1899 had the effect of advancing this glacier, as it did the Hidden and others on the Alaska coast



SERACS ON LLEWELLYN GLACIER, VIEWED TOWARD THE SOUTH

This battalion of seracs or ice pinnacles, from 50 to 150 feet in height, was formed as the glacier cascaded over the rocky ledge which connects the bases of Mussen and Llewellyn mountains



THE ICE OF A PRIMEVAL WORLD

The bare rock forefoot of Mussen Mountain, where the rocky reef starts across the ice field toward Llewellyn Mountain.—This photograph, made by L. C. Read from a camp at timber line on Mussen Mountain (about 4000 feet above sea level), shows well the seracs at the upper part of the glacier mass (the left above) and the moat [illegible] stream and the mountain-side

The Dawn of Art

By GEORGE LANGFORD

I

IN age remote when beasthood was in flower,
A race of broad-cheeked, big-boned stalwart men—
Vanguard of first full-fledged humanity—
Moved westward from the dark mysterious East
And settled near the bounds of southern France,
Beneath the shadow of the Pyrenees
Where caves and rock-walls served them to defy
Chill storm-wrath of the glaciers sweeping down
From Scandinavia and the Baltic Sea.
Bold spirits, these true pioneers of France,
WARRIORS of Crô-Magnon.

II

TROGLODYTES—cave men of the Old Stone age—
To whom the use of metals was unknown,
With flint-tipped dart and hafted palæolith
They fought the mammoth and rhinoceros
And matched their strength with lion, wolf, and bear.
Naught but the skins of beasts and gloomy dens
Shielded their nakedness, while kindled fires—
Divine bequest, the Staff of Human Life—
Guarded their thresholds from fierce prowling brutes
And furnished means to thwart the glaciers' chill—
Long-headed, high-browed, of five senses keen,
With human attributes deeply ingrained,
HUNTERS of Crô-Magnon.

III

ALL praise for those to whom meet praise is due,
Whose heritage inborn full well compares
With the Athenian Greek true ken of art.
How small their means and crude! Gravers of flint
For etching work, and pigments black or red
Laid over incised lines or bas-relief
Carved on the walls and ceilings of their caves.
The forms of beasts—not those of men—they drew;
None knew just why. Some mystic awe inspired
These ancients to portray their mural work
Not at the cavern's mouth but far within
The dark cramped depths befouled with slime and ooze,
Where none but bats and owls dared penetrate;
Where kneeling, crouching, lying prone to earth
Beneath low roofs, betwixt converging sides,
With fat-fed lamps of stone to light the way,
Laboriously they scribed each masterpiece
With flint-point on the mold-stained limestone walls—
ARTISTS of Crô-Magnon.

Creating a National Art

By HERBERT J. SPINDEN

Assistant Curator, Department of Anthropology, American Museum

Nationality develops the essentially intellectual bond of common thought. Because of this common thought there is before the people of America the possibility of evolving an art which will represent a new complex of life, based on a philosophy of logical and mechanical efficiency, political equality, and personal service to society. The art to come which fittingly embodies these things will be our national art.

This art must be useful in itself and not a senseless load upon the utilities of the age, nor an empty gratification of vanity. It must be beauty in cotton as much as in silk, in copper as much as in gold. It will be joyous Romance and heartfelt Ceremony in our homes and in our streets, in our work and in our play, for the seven days of the week.

TRUE nationality has always expressed itself in art: we judge the nations of the past by the objects of use and beauty which they created. Likewise by our peculiar art shall the nations of the future judge us. But have we been able, up to the present time, to stamp a clear imprint of our collective individuality—or nationality—upon the things that we make and the thoughts that we think? And, if so, are we content to let the record of our achievement stand for all time on the qualities of form and ornament that now enter into our lives?

Most persons, thinking of art only as fine art and knowing the works of European nations where collective individuality is seen in literature, music, costumes, architecture, and many other things, will humbly admit that we have failed to produce in America a mass of works that fittingly embodies our national hopes and ideals. But art is more than fine art and therein lies the promise of our future. We have already laid the ground for coming excellence in ways which few consider.

The Length and Breadth of Art

Art, in its widest meaning, is man's expression or embodiment of his ideas of use and beauty in different modes and materials. If the emphasis is laid on use, the product is called utilitarian art; if on beauty, it is called esthetic art. But never are use and beauty entirely dissociated, for the utmost development of usefulness depends upon orderly construction, and the finest expression of beauty is necessarily organic. There are law and order in common speech as well as in poetry: there are qualities of form which please the eye while they administer to mechanical excellence, in the canoes, cooking pots, and automobiles of everyday life as there are, for instance, in marble statues of all but forgotten gods that we now regard as purely esthetic.

Of course these marble statues of ancient gods originally played an important and useful rôle in the life of the people to whom they are accredited, although to us they are merely beautiful. It was an intensely practical thing for the Greeks to bribe and flatter a god into bestowing his divine favor upon an individual or a city by pledging a statue in his honor, as they believed such means effective. And when to this idea of ensuing benefits were added religious awe, pride of place, and good craftsmanship abetted by competition of fellow workers, the marble monument found a quality greater by far than the quality of the man who carved it. Such art is not individual—it is communal. The at-

tention of the Greek sculptor may have been directed toward the human body as an almost exclusive subject for skillful portrayal not because this is necessarily any more beautiful than the bodies of other animals, or plant growths, or shapes of land and sea, but because in the communal understanding the gods had human forms. Other cultural facts doubtless contributed to this specialization but the religious idea was foremost. If the great florescence of Greek culture had come a thousand years earlier, perhaps Hera would have been represented as a cow, like Hathor of the Egyptians, instead of as a stately woman. Under such conditions Greek art would have had a different scope and interest without a necessary decrease in esthetic qualities. In a word, every great expression of art has its roots in communal concepts, religious or otherwise, and the artist is at his best when he forgets himself and speaks for his people and his times. The frieze of Phidias was obscure architectural decoration wrought with sincerity in a place where the gods could see better than the critics. In the history of dead nations from least to greatest there was never art for art's sake, but always art for life's sake.

The Creative Civilizations

History shows comparatively few great civilizations that gave rise to high and original forms of art but it shows many lesser and derived cultures which were able to develop a considerable degree of individuality. Even among the great creative civilizations there are numerous features taken from earlier or outside sources. The type civilizations, upon the products of which must be based any statement of what a national art can and should be, are as follows:

1. Assyrian
2. Egyptian
3. Greek
4. Chinese
5. Mayan
6. Peruvian
7. Christian

In addition to these, mention may be made of the welter of signs and symbols strewn over the Far and the Near East by the great religious tides of Buddhism and Mohammedanism. Then there are the numerous specialized fields of decorative art spread across all the continents and down the centuries. For instance, there is the realism of Palæolithic art in ancient France and Spain, and its modern counterpart among the Bushmen of Africa. There are the Neolithic, Bronze, and Iron age cultures of Europe and the rich remains of pottery from various archæological provinces in America. Lastly, there are the various "culture areas" of the ethnologists among our present day Indians, South Sea Islanders, and African Negroes.

The term national art may, perhaps, be used in connection with these great creative civilizations but it must be admitted that linguistic bounds, which many persons hold to be the bounds of a nation, are exceeded in nearly every instance by cultural bounds. Community of thought is established more easily within a single language than across several languages, yet there are numerous instances where a single culture covers the field of several languages. A good example is that of the Pueblo Indians of the Southwest, the descendants of the ancient cliff dwellers, who speak four distinct languages yet have practically identical religious beliefs, art forms, and social organizations. We naturally think of imperialism and military conquest in relation to the spread of culture, but some of the most artistic peoples have been singularly devoid of the military spirit. Religious conversions account for the spread of significant and symbolic art in some instances and in other instances there simply has been expansion from the area of high culture into adjoining areas of low culture, a phenomenon known to anthropologists as acculturation.

Of the type civilizations already listed the Assyrian, Egyptian, Chinese, and Mayan are primary in features such as the invention of writing, and the development of elaborate religious and social systems strongly reflected in ceramics, textiles, and architecture. But, long before the foundation of these civilizations, must have come the inventions of agriculture which were independently achieved in the New and the Old World and which made possible a great increase in population and stimulated the growth of religious and social orders.

The Greek efflorescence had as its base the developed art, religion, and philosophy of the earlier civilizations in the classic field. It started from a higher level of positive achievement. Greek art is characterized by a cold, chaste realism which speaks to all peoples, but it is singularly weak in ornament and is practically devoid of the formal creations arising usually from a belief in beast gods, that are so important in the arts of Asia and the New World.

After the militant era of Rome the art of Greece passed into eclipse and was succeeded by the warm art of the Christians, which on the ornamental side drew many of its forms from the Bronze age and Iron age products of northern Europe. The Renaissance was a rebirth of classic form but not of classic spirit, although in the minds of many persons the most satisfying productions of the sixteenth and seventeenth centuries are really the full-blown flowers of Christian symbolism.

The political units of modern Europe have distinguishable products but none of them has a really great national art. The mere variation in languages creates a feeling of greater difference than actually exists. After all, language affects only a part of the art products of a country, and, at that, nearly all European languages belong to one great family.

The Substance of National Art

National art means more than an objective "complex" of design motives, or a mass of monumental sculptures formally related to history, or schools of painting with distinguishable technique. It means permanent and continuous expression of the ideals and emotions that characterize and unite the members of a large social group. Without this spiritual and intellectual content, art is nothing more than an assemblage of shapes and sounds which react harmoniously on sensory organs that are practically the same for all humanity.

Many artistic shapes of universal occurrence have come about for no other reason than that they express absolute esthetics in line and mass, just as various scales in music express absolute harmony in sounds. Among such shapes may be mentioned the fret, spiral, and swastika. Geometric art can be understood universally for the simple reason that it has no meaning but, instead, a sensuous appeal. Of course it can be given a meaning: sometimes one hears it said that the swastika is a sign of good luck and that the fret meander represents the endless wandering of the soul after death. Those universal shapes came into being in different parts of the world, as has been said, because they embody a simple and fundamentally artistic relation of lines just as the pentatonic scale embodies a fundamentally artistic relation of sounds. In one region these shapes may have been given the arbitrary meanings stated above, but such meanings are not inherent in the shapes.

Realistic art can be understood universally because it is frankly objective. Of course South American Indians might not understand a drawing of an elephant or a walrus, and an Eskimo would probably turn the picture of a palm tree upside down before he recognized it as the feather duster of the

missionary. The first graphic art in the world, that of Palæolithic man, was realistic and rather finely so. But realistic art may have significance quite beyond the objective fact. To France the *fleur-de-lis* is more than a flower.

Conventionalized art, as it is often called, or formalized figures that have elements of realism and elements of geometric order, are more intellectual than either realistic or geometric art. They are not found among the lowest peoples but only among those who have ceremonies, religious beliefs, and so on, of fairly developed types, and their significance is relative, or cultural, rather than absolute. They constitute a positive contribution to the mass of human creations.

The esthetic quality of art will take care of itself if only there is a proper field and sufficient time for selection and the survival of the fittest. The eye and the ear are mechanical organs that naturally select shapes and sounds with certain physical characters. Moreover, many kinds of construction, especially in textile art, compel a fine quality of order in decoration. Besides this, animal and plant forms and even shapes of land and sea have esthetic qualities which are the direct result of the mechanical forces that operate within or upon them, with the result that finely realistic art reflects organic beauty in nature.

But before we can have a really national art we must express or embody a mass of national ideas and emotions in things of everyday life. We have solid ground to build upon and blocks for the building. Politically, the democracy that exists in America today is of a type and quality that has never existed elsewhere in the world. The old religion of rewards and punishments is giving place to a new religion of social service. Mechanically, we have wonderful new appliances to save labor and turn the energy of the hand into energy of the mind. In other words there is before us the possibility of writing into art a new complex of life, based on a philosophy of logical and mechanical efficiency, political equality, and personal gratification attainable only through service to society. The art to come that fittingly embodies these things will be our national art even though it spreads beyond our political limits and proselytes the world.

Out of Efficiency Comes Beauty

Out of efficiency comes beauty, that is the law not only of human art but also of that greater art seen in the refinement of all natural forms. Survival in the struggle for life among plants and animals is made possible by the proper correlation of many functions in the body of an organism which is, in effect, a complicated, self-operating machine. When the mechanism is perfect, the lines are good. An esthetic interest resides in shapes modeled for use.

The proof of the mechanistic basis of esthetics is manifold. In this connection it is interesting to read a passage from the ancient writings of Plato in which Socrates instructs Protarchus concerning the place of knowledge in the handcraft arts. After saying that little will be left if arithmetic, mensuration, and weighing be taken away from any of these arts, he continues:

> SOCRATES. The rest will be only conjecture, and the better use of the senses, which is given by experience and exercise, in addition to a certain power of guessing, which is commonly called art and is brought to perfection by pains and practice.
>
> PROTARCHUS. That is very certain.
>
> SOCRATES. Music, for instance, is full of this sort of thing as is seen in the harmonizing of sounds, not by rule, but by conjecture; and this is always the case of flute music, which tries to discover the pitch of notes by a guess, and therefore has a great deal that is uncertain and very little of pure science.

After two thousand years these statements come pretty close to the

truth. But by "the better use of the senses" draftsmen discovered the facts of perspective drawing centuries before demonstration and proof of vanishing points and horizons were made by an English mathematician. Similarly the harmonies of sound were written down in scale music long before Helmholtz and others elaborated the facts that vibrations carry sound, and that harmony is due to mathematical correspondences between the numbers of vibrations in a given period of time. Some day, science, after gaining a proper understanding of the human eye as a super-delicate keyboard of rods and cones for the testing and selecting of shapes, tones, and colors, will be able to demonstrate exact rules of visual esthetics. In the long history of human art these rules are illustrated by the independent invention of the same shapes and color combinations in different parts of the world.

A close parallel may be drawn between the life history of the art of a social group of human beings and the life history of plant and animal families. Both are organic and have a long period of development and a shorter period of florescence. In the case of human art the cycle is completed in a few centuries while in plant and animal life it may take geological epochs. Conservative and radical forces operate throughout nature as they do in human art. If we take a given form embodying use, which may be a tool, a magical design, a plant, or an animal species, we find it modified, first by a continual refinement leading to a type form that meets the general conditions and requirements of life, second by a continual selection of special forms that meet special conditions. A canoe, for example, is refined until it reaches a shape that moves most readily through the water. Such a shape cannot avoid having an esthetic interest because it is orderly. But while such refinement leads to a type form, it is found that the canoe men have also been introducing changes in shape for sea-going canoes as contrasted with those for river navigation. Usually there is a new factor of mechanical advantage entering into the question. Differentiation in plants and animals is usually along lines of new mechanical advantage.

But specialization, while it strengthens in a special field, weakens in the general field of activity. Thus Palæolithic man had at first a stone tool that came to have pretty definite shape and which he used to chop, cut, and drill with. Later special shapes were developed for these special uses but general efficiency was lost in the process. In other words it was more difficult to chop or cut with the drill form than it was with the original undifferentiated tool of all work.

In any case esthetic qualities come into a form which is developed by and for use. There is a point of fine balance and after that the quality of esthetics in an object becomes a growing danger. Biologists recognize as "end products" many highly specialized plants and animals which have developed esthetic characters along with their adaptations to narrow conditions. Such esthetic characters are iridescence and similar bright color effects, spines, and other fantastic excrescences, and extreme convolution or attenuation of the body. Among plants the orchid family shows many examples of extreme specialization in life associated with strange shapes and colors, and among animals, the many-chambered nautilus is analogous. These are about to die, as the sea lilies, trilobites, ammonites, brachiopods, and giant lizards have already died through overspecialization, leaving only a few of the more sturdy members to represent the family.

The life story of human art on the esthetic side is from strong simple forms associated with use to compli-

cated and flamboyant forms in which the usefulness is largely suppressed. Then comes the end. There is flamboyant Greek art, flamboyant Gothic art, flamboyant Mayan art, all showing the same tendencies that parallel the end products of natural history. Out of efficiency comes beauty, and out of beauty comes death.

The Art of a Mechanical Age

It has never fallen to the lot of any nation to give to the world so many new ideas in processes, machines, and constructions as we of the United States have given in the brief span of our history. Invention has been riot among us ever since the English officer observed that the children on Boston Common breathed in freedom from the very air. Our faculty of doing new things unthought of before, or of doing old things in new ways, is essentially a social phenomenon coming out of the release from traditional restraints. The citizens of the United States of America have shown a collective quality of mind as regards mechanics, which does not owe its origin to any particular line of blood or training. That something "from the very air" infected John Ericsson no less than Robert Fulton, and it continues to infect the heterogeneous sons of a hundred Old World nations who come to our shores to build new homes in the sunlight of a new philosophy.

The decoration that goes into the lives of people in this mechanical age must be largely produced by machinery; but it must be given spiritual and intellectual content. We may wink at Homer and take our designs where we will, but we must fill these designs with the spirit of our own times. There is work for great artists, and those who regret they could not learn their trade at the feet of Phidias or Michelangelo need not apply.

There are still many persons in America who judge art by three tests when only one is necessary. For them, a thing to be artistic must be rare and costly as well as beautiful. As a result of this curious kink in appreciation the industrial art of a previous epoch is to these people fine art while that of today is not. An invidious distinction has been fostered in the public mind that objects of art, passing into quantity production, necessarily lose fineness and spirituality and take on a smell of machinery.

It is true that to have fine art you must have the scrutinizing care of fine workmen over their product. But there have always been machines and each age has used the best it could devise. The sculptors of today model in impermanent materials and then turn the making of the permanent copy over to an artisan operating a power-driven chisel or to a bronze founder who knows the technique of casting metals.

There are class distinctions among artists which have come down from the days when princes were patrons and which hardly belong in a democracy. A portrait painter is put on a higher artistic plane (quite aside from the merits of his work) than a maker of costumes who may administer to the same personality for a comparable reward. One kind of art is condemned as regards the higher values of appreciation by being called commercial and the other vaunted as noncommercial. The distinction is no longer a real one. As to the relations between emotional expression and money, everyone has heard divergent sentiments like the following: "No real work of art was ever made for money." "Poor man, his finest efforts were potboilers." There is a great deal of false sentiment concerning artists. They are nothing more than specialized workers, like physicians, lawyers, and scientists, and they earn a precarious or magnificent livelihood by a display of individual ability. But there is also splendid romance amid the whir of wheels, or

where the cantilevers reach out to join hands across the river. There are men in all walks of life who have faith to follow airy voices and logic to prove the impossible easily possible. There are master workmen in mills and factories who, while they recognize the master workmanship of a distant past, see in it only a spur toward greater achievements in the future.

Has decorative art a practical value in commercial products? In the naïve minds of savages designs are often regarded as magical devices to bring good and ward off evil, and as continuous prayers to the gods. I like to think that decorative art is still magical and able to fill dark places with sunshine. But the business man often wants practical value counted out on the table. Successful decoration adds distinction to any product. American textile houses during the last four years have learned how to add good decoration to good construction. As a result American silks have sold in Paris, and selling silks in Paris is like selling coal in Newcastle. With such a guarantee of artistic quality, should we not sell to the most discriminating buyers both at home and abroad? Artistic quality in the goods of commerce means a higher proportional value of mind and a lesser value of material in the manufactured article. Where the raw materials have to be imported as in the case of silks, fine pottery, and the like, it behooves the manufacturer to enlarge the proportional value of workmanship in the completed product.

Art education in America has until recently been in appreciation rather than in production. The most successful artists in textiles and costumes have come out of commercial workshops rather than art schools. But the schools are better capable of inculcating a sound and fundamental philosophy of art than are the workshops. The youth of America should be taught that only the good is beautiful and that only normal and organic ornament deserves praise. Let the slogan be "Beauty is as beauty does."

Symbols and Loyalties

Because man is a herding animal he cannot avoid community loyalties. There are the family, the tribe, the nation, each based upon a larger and larger idea of coöperation. There are also other human associations that fall outside the three already mentioned and that compete with them for a share of loyalty and support. For instance, secret societies and lodges are found among both primitive and civilized peoples; there are ceremonial organizations of warriors, hunters, and medicine men; there are masons' and drapers' guilds, granges, trade unions, clubs, and political parties. But as a supreme human group the nation goes far beyond the primitive bond of blood or the selfish bond of common vocation and develops the essentially intellectual bond of common thought. For a civilized people the first of all group loyalties should be loyalty to the nation, and this becomes stronger as symbols are invented to express it.

The flag is preëminently a symbol of nationality, and other symbols are public buildings and utilities such as highways and wide-arching bridges, which give a sense of common ownership stretching beyond narrow acres. And there are many other subtle or direct symbols that unexpectedly voice widely felt but inarticulate desires. National art brings about social amalgamation whether the means of expression be slogans and rallying songs, monuments, parades, uniforms that put rich and poor in the same rank, or simple objects of use and beauty, such as costumes, flower jars and fountain pens, that build up an understanding of life which is good, true, and of our own times. With common thoughts as warp and weft a strong fabric may be woven which shall become truly beautiful as

it is embroidered with deeper and deeper emotions.

And loyalties that are developed through art, what part may they take in the political life of a people? It is strangely true that loyalty thrives on the very duties and sacrifices that its existence makes practicable. If an organization, great or small, does not demand service of its members it can hardly continue to exist. The success of revolutionary movements in art, politics, or religion is measured by the degree in which the individual is made to feel his submersion in the group. Always there must be symbols, like the carved fishes in the catacombs, to lighten the hours of trial and torment and to record permanently the hours of joy and triumph. The nation is best equipped to exert its full power for progress and production when it can oppose the forces that would undermine its hold on individual members, by loyalty that is personal, concrete, and pictured in every mind.

We hear much of internationalism. Perhaps this means sympathy and a sense of justice among nations and a *modus operandi* of securing these things. Nationalism divides mankind geographically and develops vertical loyalties that unite different classes of society into an organic whole capable of diversified production. There is, of course, always the danger of conflict between two nations just as there is between two individuals. But if internationalism means a horizontal division of mankind on the basis of class, with the threat of conflict above or below, it can offer no advantage to the world. History indicates that the nation is the largest association of human beings capable of having and adequately expressing communal ideas of use and beauty. It may expand far beyond the limits of blood and speech and may, perhaps, even encompass the world. Let there be friendliness between political units by all means but let there also be refreshing contrasts in thought.

A truly national art will express and extend the joys and satisfactions of the people as a whole; it will awaken a consciousness of universal sympathy, and put new purpose and beauty into many lives. The esthetic art will be organic and useful in itself and not a senseless load upon the utilities of the age, nor an empty gratification of vanity, nor a mere sensuous tickling of nerve ends. It will be beauty in cotton as much as in silk, in copper as much as in gold. It will be joyous Romance and heartfelt Ceremony in our homes and in our streets, in our work and in our play for the seven days of the week.

POSTSCRIPT

SINCE the preceding article was written the first general American exhibition of textiles and costumes, illustrating the splendid advances in industrial decorative art during the last six years, has been held in the halls of the American Museum of Natural History. The exhibition developed the value of first principles in construction and decoration even where commercial vogue in fabrics and women's clothes is concerned. Historical sources were shown for the machine, for the design, and for the costume.

The great roaring machines of today are but the logical extension of mechanical parts and principles known of old, weaving in some form or other is as old as human society, and there has always been personal adornment forming a basis of the costumer's art. The Jacquard looms, with their busy shuttles and myriad harness strings, bewilder with a multiplicity of detail. Yet the essential features can nearly all be seen in simple machines used by Philippine tribes. All the types of weaving, as well as many methods of decoration, such as cylinder printing, block printing, warp tie-dyeing, batik, embroidery, appliqué, and stenciling, are found among the lesser and earlier nations. The

modern designer and artist cannot afford to neglect fields in which the fittest and finest have been determined by centuries of selection.

The special contributions of our age are new sources of power to replace the muscles of man, new possibilities of collection and distribution that bring us materials from afar and that send our made products across the limits which divide nations, and, lastly, new horizons of suggestions and inspiration for our ideas that are practicable and profitable.

In five or six years America has come a long way toward developing an adequate expression of her artistic individuality. But this progress has been in the shops rather than in the schools. It has come from a use of facts, not theories, and from an objective study of the relations between form and ornament, between the technical process and the design. The examples of applied art in the various museum collections have aided in this forward movement.

Behind all progress, however, there are human personalities. Always there are some men and women who see with an inner eye the things that may be and then with ingenuity and courage make them the things that are. It is not only to the new artists who have found success that praise should go for the recent advances of American industrial art and for the bright hopes of the future. Likewise a tribute should be given to certain definite individuals: M. D. C. Crawford, who established contacts between science and the trade and who wrote, talked, and clarified till the last doubt died; E. W. Fairchild, who put money and enthusiasm into a program of publicity when the skies were unpropitious; David Aaron, Albert Blum, Charles Cheney, Irving E. Hanson, Max Meyer, and Jessie Franklyn Turner, who from the first have joined their faith with ours and whose artistic skill and perception have stamped qualities of distinction on new products.

The problem now broadens to one of general education in the public and private schools of America. For the schools will be called upon to supply the industries with craftsmen whose minds and hands have been prepared for efficient service in the present world. The explorers and the pioneers have blazed a trail and marked a road. They have come with an earnest of accomplishment in their hands and an offer of experience and tested success that those who come after may build safely and grandly.

The principal exhibitors who coöperated with the American Museum of Natural History in the exhibition of Industrial Arts in Textiles and Costumes were as follows:

David Aaron & Co., Inc., embroideries
American Bead Co., Inc., dress accessories
A. Beller & Co., cloaks and suits
Emile Bernet, tapestry yarns
Blanck & Co., embroideries
Sidney Blumenthal & Co., Inc., velvets
Bonwit Teller & Co., tea gowns and negligees
Cheney Brothers, silks
Harry Collins, costumes
B. C. Faulkner, blouses
Marshall Field & Co., Inc., cretonnes
A. H. Flanders & Co., blouses
Funsten Bros. & Co., sealskins
Johnson, Cowdin & Co., Inc., ribbon weaving
Otto Kahn, Inc., fur garments
Kevorkian Galleries, oriental art
H. R. Mallinson & Co., Inc., silks
J. A. Migel, Inc., Jacquard loom
Marian Powys, laces
Ruth Reeves, batiks
Martha Ryther, batiks
Barbara Simonds, hand prints
Hazel Burnham Slaughter, batiks
Mary Tannahill, batiks
J. Wise Co., Inc., costumes
Women's Wear, costume books

The Museum gratefully acknowledges the assistance of many of these exhibitors toward the cost of the following photographic insert covering the exhibition.

SERIES OF PHOTOGRAPHS FROM THE FIRST EXHIBITION OF AMERICAN TEXTILES, COSTUMES, AND MECHANICAL PROCESSES

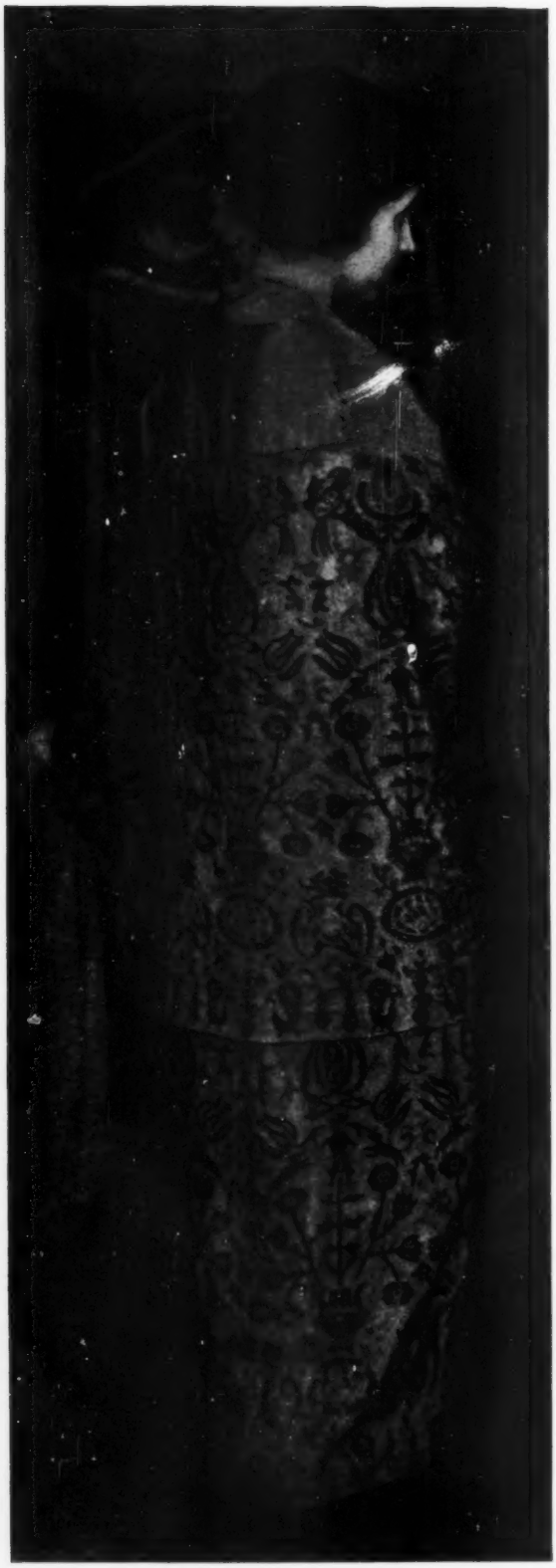
HELD AT THE AMERICAN MUSEUM OF NATURAL HISTORY, NOVEMBER 12 TO DECEMBER 1, 1919

LEGENDS BY HERBERT J. SPINDEN

YOUNG AMERICA IN THE RAIMENT OF OLD PERSIA

In former times each nation had its few special styles in dress and there were slow processes of refinement that operated upon these styles. Now dress is cosmopolitan, but cosmopolitan with an almost personal variation in detail. There are fundamental types that return in the vogue from time to time, and these go back to the old national styles. The wraiths of the past come and go like shadows—or shall we say silhouettes?

Kevorkian Galleries



A Bokhara Reproduction.—*Bonwit Teller & Co.*

Proposed Museum

Connected with the American

AMERICA has reason to be vastly proud of her recent progress in expressing beauty through the things of everyday use. The Exhibition of Industrial Art in Textiles and Costumes, covered in part by the series of photographs that accompanies this brief statement, disclosed new forces in American life. It disclosed a will of the people to work and think together, an ideal of individual satisfaction in the common good, a conception of the nation as the exponent of a philosophy of justice, industry, and well-being, and a recognition of the place of beauty and good craftsmanship in the things that men and women spend their lives to create.

Such emotional forces, engrossing society, are the surest protection against the doctrines of individual or class selfishness. When the national consciousness shall be duly expressed through all the little things that touch life, through garments and dishes and house furnishings, the great things will assume a new significance. And in bringing about such a realization what would be more effective than a great Museum of the Passing Today, which would stage kaleidoscopic expositions of those emotional qualities that glorify labor and serve as an educational clearing house of objective teaching in what is good?

A museum of commercial arts would, in effect, be a museum of the ethnology of today. It would be entirely justifiable from every scientific standpoint and would receive public support because of its direct relation to life in its broader aspects and to the special problems of arts and industries. Such a museum need not be involved directly in the

# of Commercial Arts

Museum of Natural History

competitive activities of commerce. It can reserve for itself a position above criticism as an umpire of the best in construction and decoration and as a teacher of facts and fundamentals.

The great arts into which decoration enters, or into which it may enter, involve tremendous values in men and money. Mention need only be made of textiles, costumes, pottery, jewelry, and house furnishings. All of these have their foundations set deeply in the arts and crafts of the lesser and earlier nations. It would not be proper to show such arts except in historical perspective and the American Museum of Natural History with its great collections from all times and all parts of the world is best able to furnish such a perspective. Moreover, this public institution has a record of solid achievement in its relation, first to industry, and second to education.

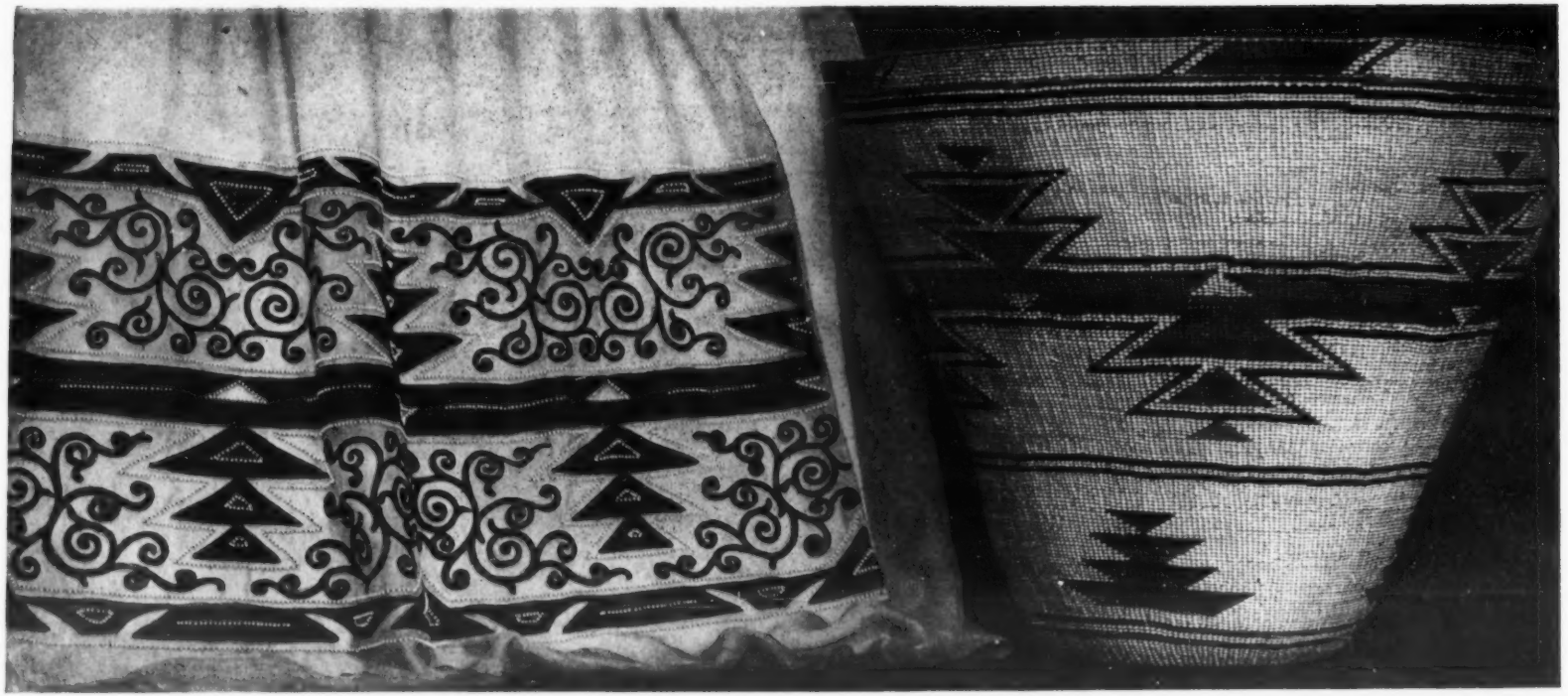
Let us imagine a large section of the American Museum of Natural History given over to the needs and uses of commerce. First there would be halls so arranged that the modern materials could be placed on temporary exhibition without risk or deterioration. Second, there would be more permanent educational collections covering the world range of definite processes. Third, there would be ample provision for classes in design coming from public or private schools and for professional designers coming from manufacturing establishments. Fourth, there would be scientific laboratories where special problems relating to fibers, dyes, pottery clays, cabinet woods, and so on, could be studied by experts.

After the Coptic.—*Bonwit Teller & Co.*

A STUDY IN SOURCES AND RESULTS

In this exhibit we see a clear demonstration of the use of art motives from all parts of the world in modern machine-made embroidery. The map in the foreground shows lines leading from Africa, Asia, Central America, and the islands of the Pacific to New York, and bears the story-telling label: "The world pays tribute of ideas to American art." Design, and sometimes colors, are followed, but materials and mechanical processes are different. Aside from the practical commercial value of new notes in decoration there is another practical value that comes from arousing the interest of craftsmen in their work

David Aaron & Co., Inc.



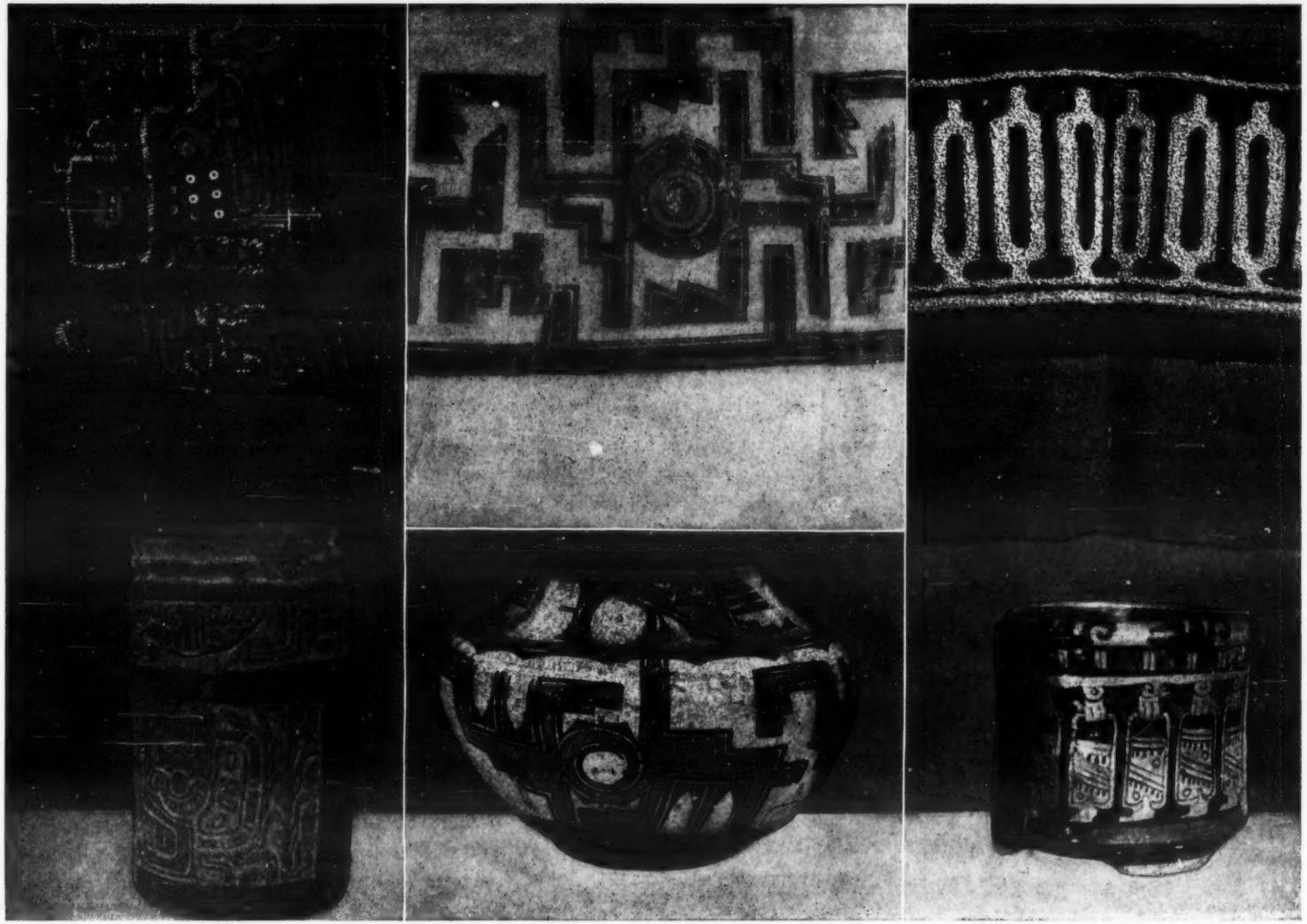
HOW THE CULTURE OF THE AMERICAN INDIAN MAY BECOME OUR OWN

There is something refreshing in the art of the American Indian. It is simple, direct and sincere; it is fundamentally good and all its possibilities of development have not been exhausted. Upon such art an education in good taste may be based. In the extensive series of photographs which the American Museum of Natural History has brought together for the use of teachers, students, and professional designers, stress is laid upon the decorative qualities that exist in the geometric and formalized motives of primitive art.

It is not the intention that the primitive motives should be used directly and without change or adjustment. Rather it is the hope that the primitive philosophy of art should be followed. According to this philosophy beauty is as beauty does. The decoration grows out of the construction and does not interfere with use or weaken the objects in any way. Instead, the decoration often actually strengthens, as when beaded strips are placed over seams or along margins in primitive garments. This primitive philosophy of art is one that Mother Nature herself follows. The blossoms of the wild rosebush grow organically out of the plant and perform useful functions. But with the excessive esthetic development achieved by over-cultivation, the qualities of usefulness disappear in the blossom. So too in art—there is a point of balance where fine efficiency is joined with fine decoration.

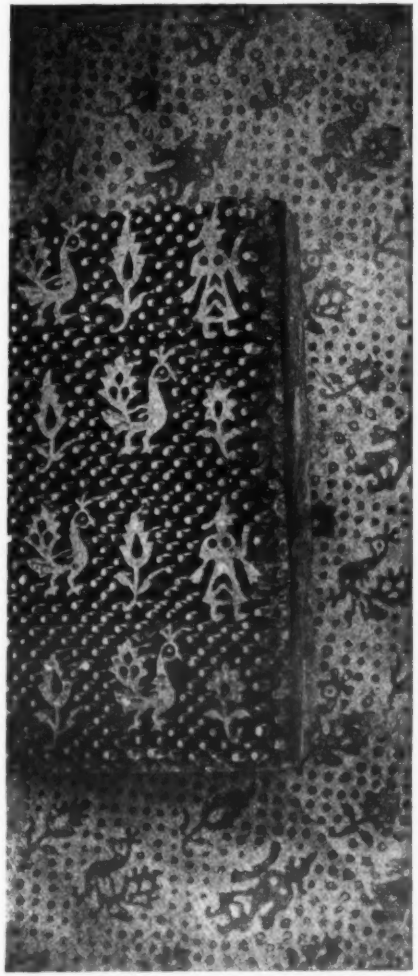
The acorn basket of the Maidu Indians of California furnishes a strong note of beauty that can be turned to many uses. Here we see an application in which the fundamental motive is applied in leather over silk. The development is accomplished by the use of beaded outlines and scroll work to fill in the open spaces

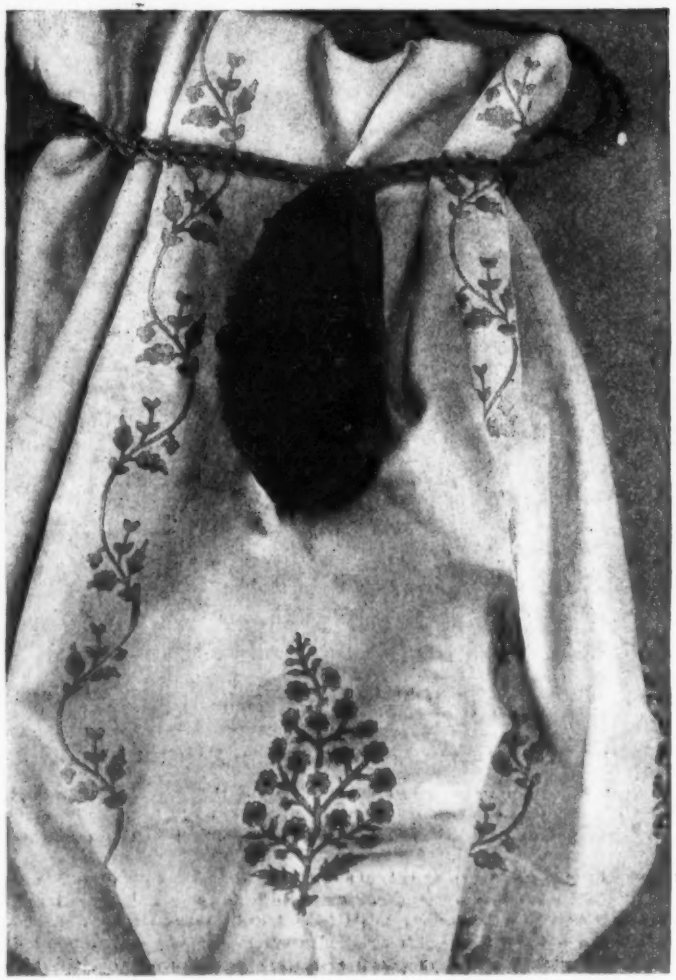
David Aaron & Co., Inc.

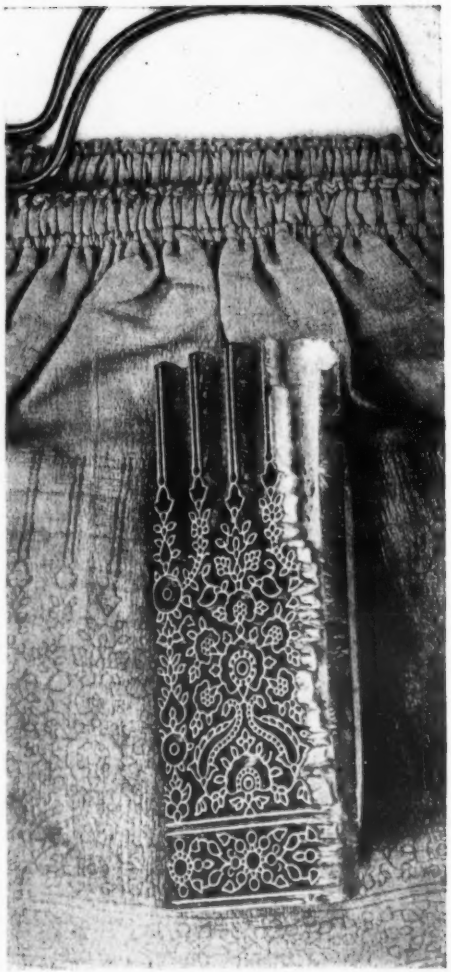


ADAPTATIONS OF POTTERY DESIGNS FROM CENTRAL AMERICA AND NEW MEXICO, IN EMBROIDERY

David Aaron & Co., Inc.



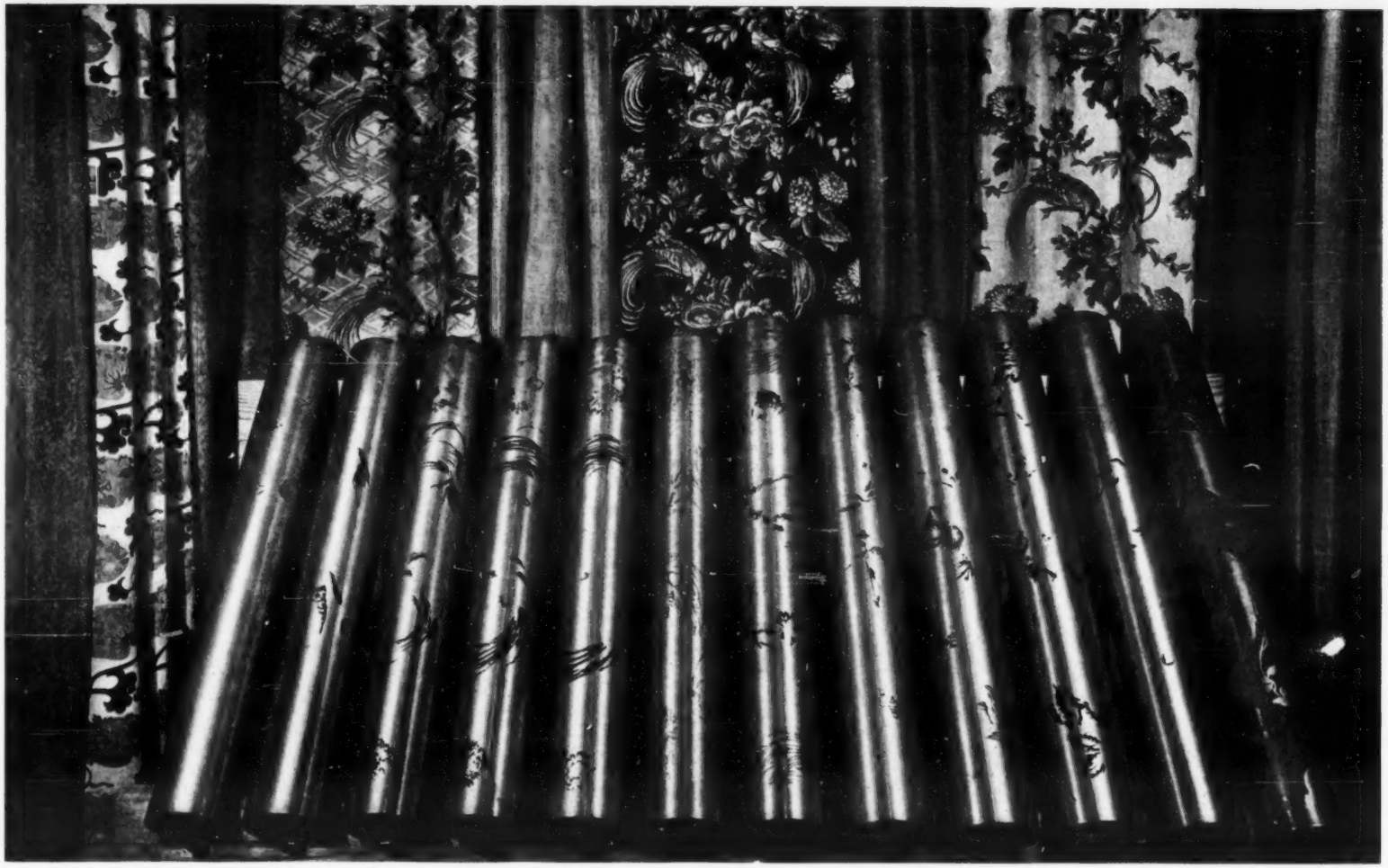




AMERICAN PRINTS FROM ASIATIC BLOCKS

Teakwood blocks from British India are here used to print designs on hand bags and other articles of New World use. In things of beauty America is the heir of all the ages—but she must learn to put something that is herself into whatever she accepts from the past

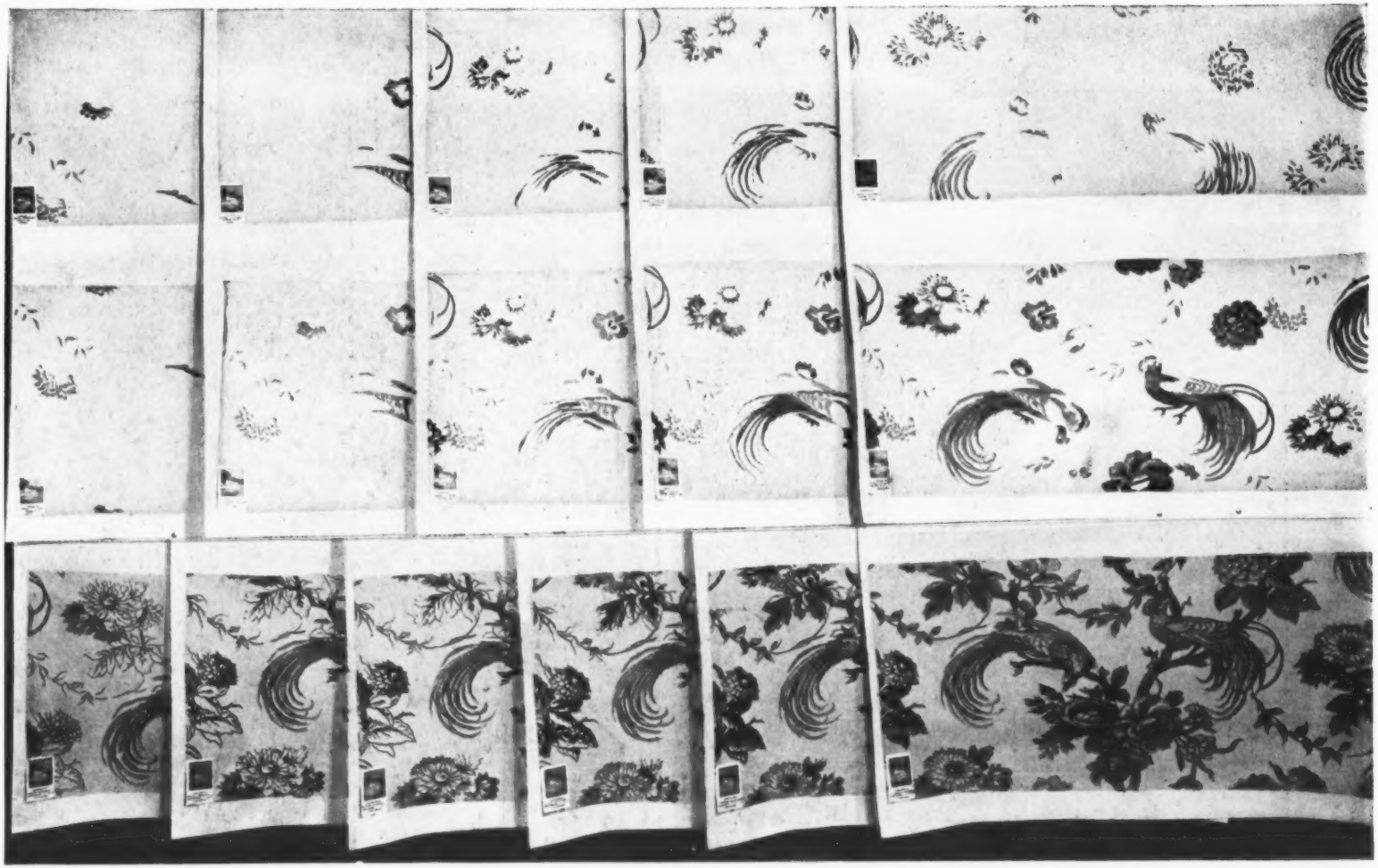
Barbara Simonds



COPPER CYLINDERS AND CRETONNES PRINTED FROM THEM

Cylinder printing was known to the Indians of Mexico, Colombia, and Peru, as well as to the Assyrians and Egyptians. Truly there is nothing new under the sun, for textile printing presses are looked upon as triumphs of modern engineering. And they are triumphs in the delicate adjustment of parts

Marshall Field & Co., Inc.



SINGLE AND CUMULATIVE PRINTS FROM CYLINDERS

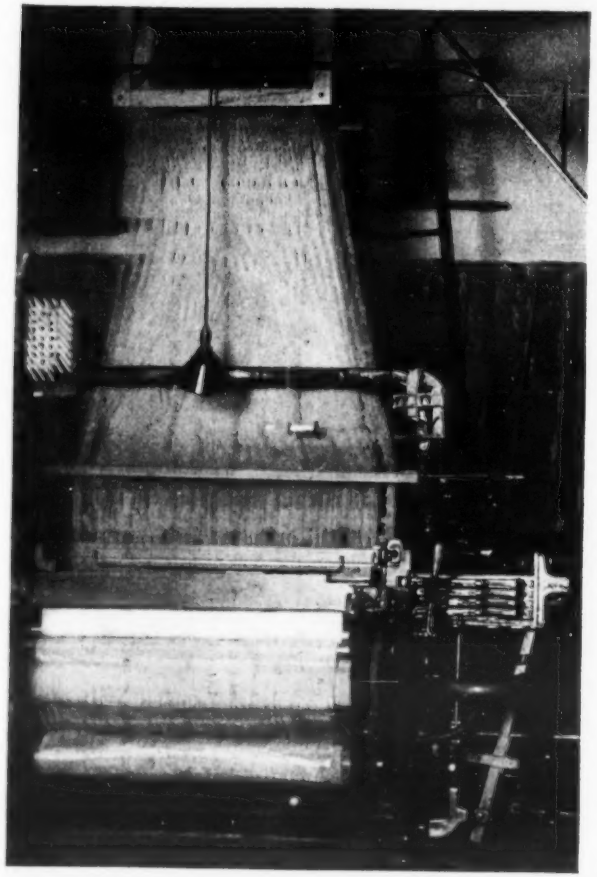
In roller printing of textiles there must be a separate cylinder for each color. These cylinders must be ground down to exactly the same diameter and in the machine the registration must be perfect

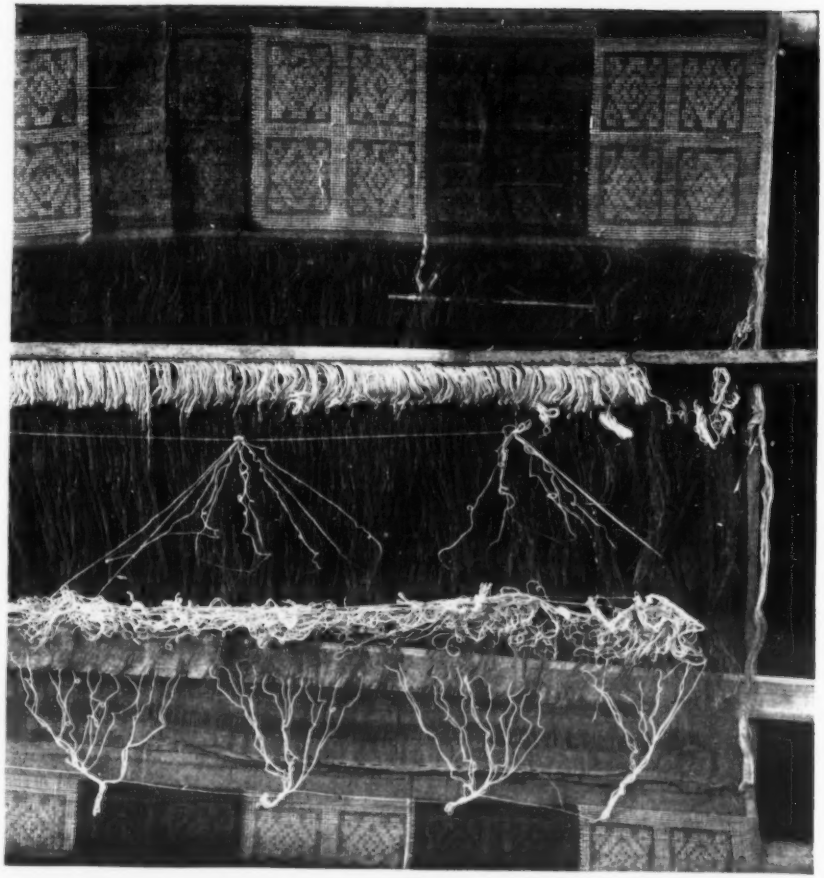
Marshall Field & Co., Inc.

BLOUSES OF MODERN AMERICAN CONSTRUCTION

In the popular blouses of today emphasis is laid on harmonious colors and on designs that have been refined to the point of simplicity. An effort has been made to relate the colors and the elements in the decoration to events in the world's history in accordance with primitive symbolism

B. C. Faulkner





A JACQUARD LOOM AND A PHILIPPINE PROTOTYPE

A Jacquard loom (at the left) for broad silk, installed at the recent exhibition and operated by J. A. Migel, Inc., was a center of attraction. With rapid mechanical precision the shuttles were thrown back and forth, a myriad shining strings rose and fell and a long train of perforated cards traveled jerkily, carrying the design as a pianola record carries music. The effect was one of bewildering motion and multiplicity of parts.

Yet the essential devices of the Jacquard loom, with the exception of the perforated cards, are seen in looms from the Far East. The Philippine example chosen to illustrate these likenesses has many sets of leases, as the harness strings for the warp are called, and when these leases are lifted up in definite order, and the shuttle is passed back and forth in the space formed between the upper and lower warp threads, a complicated design is produced. The shuttle is a stick wrapped with the weft thread and the weaving is made tight by a "beater in," that resembles a wooden sword, or by a heddle very like that seen on modern looms

J. A. Migel, Inc.

SHUTTLES CAUGHT IN FLIGHT

The mystery of rapidly moving shuttles, spilling their spider's thread of color, was solved for this child and for many adults no less interested. In the ribbon being woven on the loom installed by Johnson, Cowdin & Co., the warp threads are black and the design is brought out through the use of four shuttles each with a thread of a different color. The lowermost shuttle is seen in the act of passing between the lifted warp threads and those that have not been lifted.

In the Jacquard attachment, which makes possible the weaving of exceedingly complicated designs, there must be a separate, perforated card for every weft thread that crosses the ribbon until the repeat in the pattern is reached. In the case of the ribbon being woven here there were 1200 cards. When the card reaches a certain place it is pressed against a surface of projecting pins. All the pins are pushed back except those that are in position to enter one of the holes in the card. In this way a mechanism is released that determines which warp threads are to be lifted so that the colored weft threads will appear upon the surface to form the pattern.

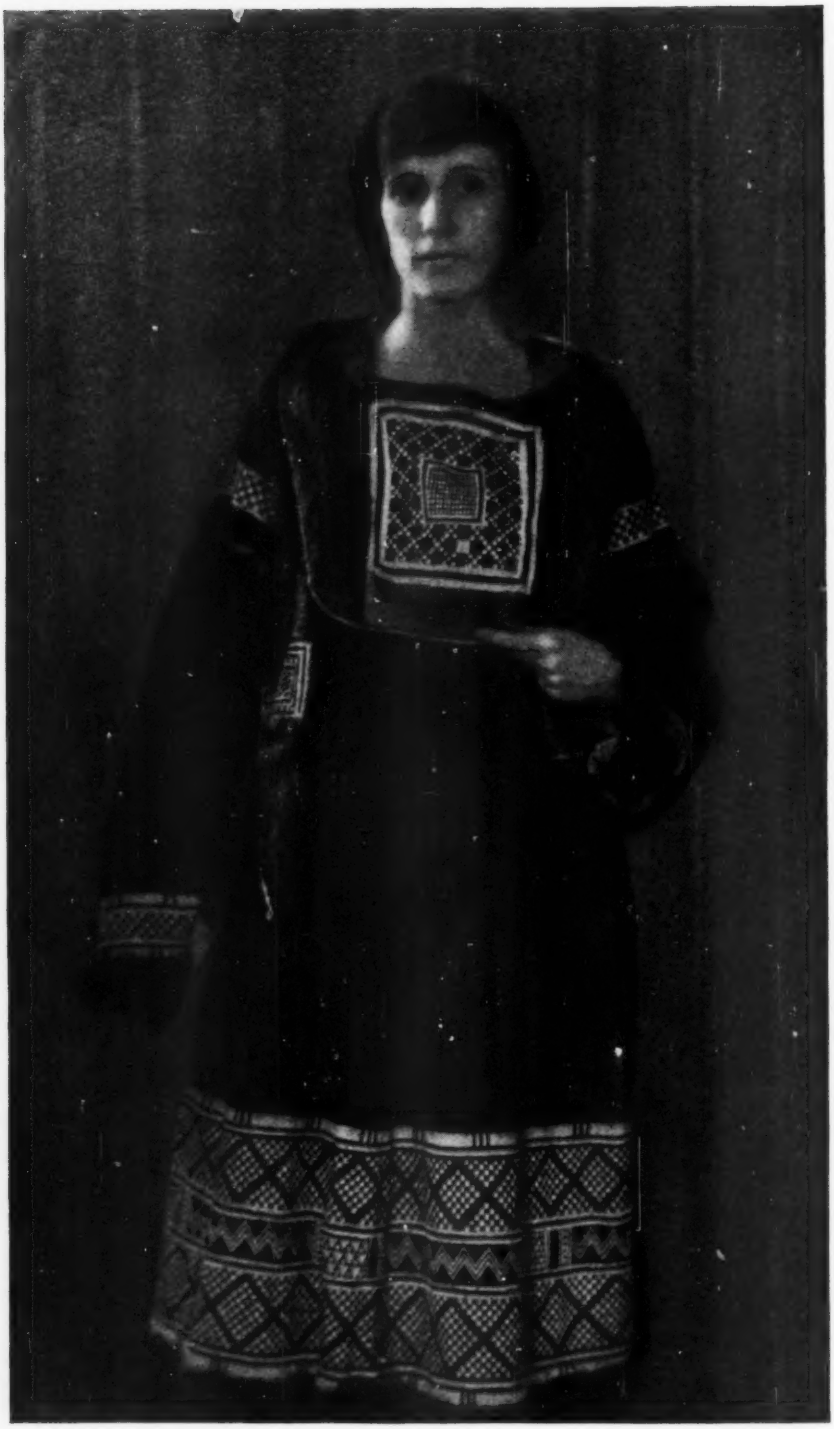
The narrow loom is used among many primitive nations in the weaving of belts and hair bands, which were the first ribbons. In America ribbons with beautiful patterns are found among various Indian tribes in New Mexico, Arizona, northern Mexico, Guatemala, and Ecuador

Johnson, Cowdin & Co., Inc.

THE GUATEMALAN HUIPIL AS A COSTUME TYPE

Three days south from New Orleans lies Guatemala where the Indian women wear gaily embroidered huipiles. These are simple, sacklike blouses but the designs are striking and the colors brilliant.

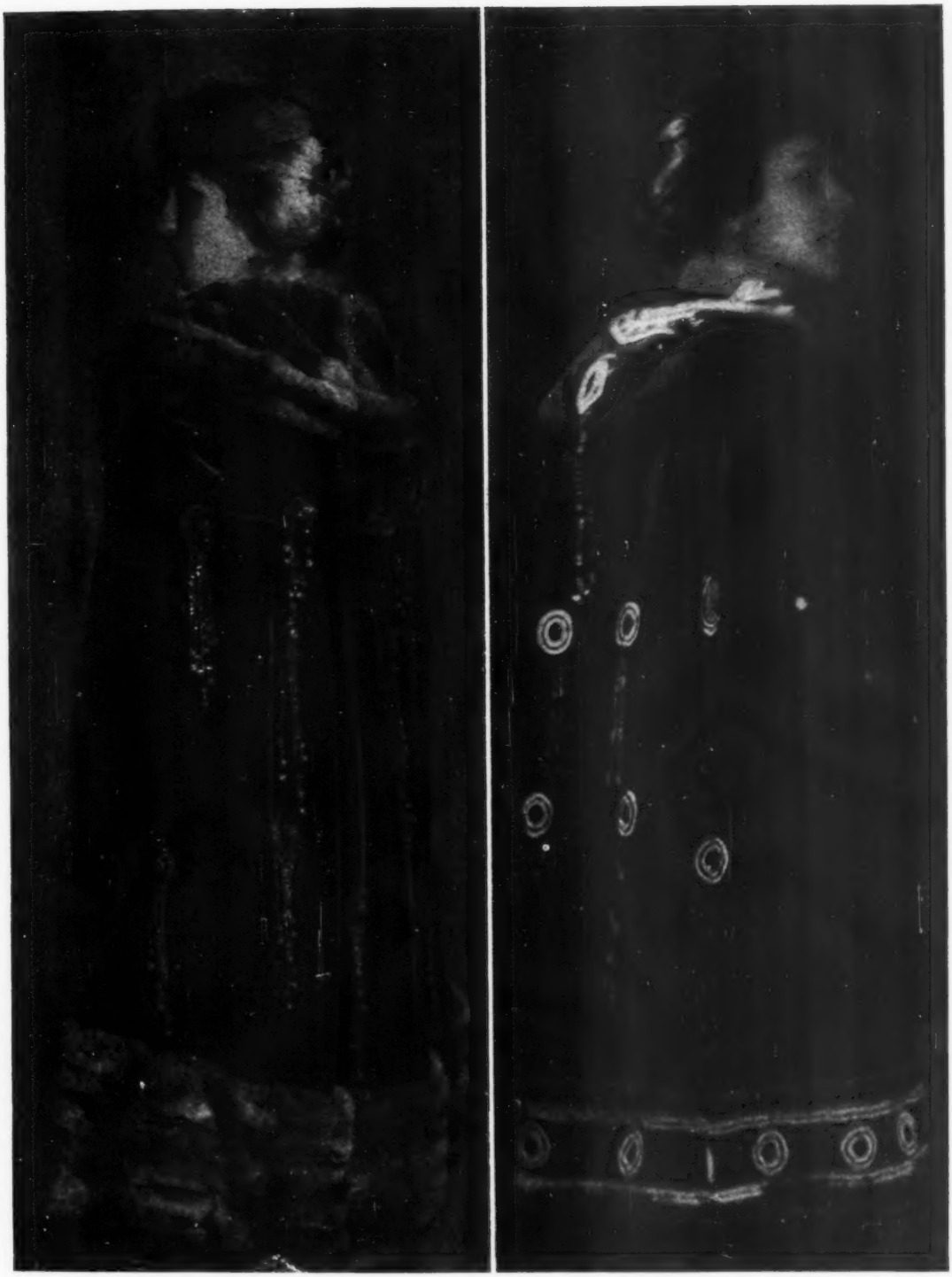
J. Wise Co., Inc.



MOSAICS IN FUR MADE BY THE KORYAK TRIBE OF NORTHEASTERN SIBERIA

The Siberian tribes that are dependent upon the reindeer are the world's most skilful workers in fur. Their long coats are provided with a hood and with a high neck piece or collar that ties up under the chin when the hood is raised or is made to lie down flat over the breast when the hood is thrown back. The decoration on these garments is often a patchwork or mosaic of fur in contrasting colors. In the garment shown here it is estimated that there are nearly twenty thousand separate pieces carefully cut and sewed together

American Museum of Natural History



A COAT FROM SIBERIA AND A WRAP MODELED AFTER IT

The natives of Siberia are wonderful makers of fur garments. In the specimen shown at the right the material is reindeer skin with the fur turned in and the decoration consists largely of medallions of blue and white beads. The essential features of this Siberian coat are followed in the exquisite wrap of blue velvet trimmed with fur, reproduced at the left

A. Beller & Co.

MODERN USES OF BEADS IN DRESS ACCESSORIES

In years gone by, a few handfuls of glass beads figured largely in the purchase price paid the resident Indians for Manhattan Island and surrounding territory. But how lovely were the necklaces and pouches which the Indians made from these beads. The vogue of beaded accessories to woman's dress has led to the use of numerous aboriginal designs. A special interest in beadwork lies in the fact that many soldiers disabled in the war have found in it pleasant and profitable occupation

American Bead Co., Inc.

A SUGGESTION FROM SIBERIA

It is a far cry from prepared fishskin to Fan-Ta-Si silk yet a wonderful fishskin garment from the Amur River in Siberia, decorated by the stencil and appliqué methods, gave form and character to this lovely gown

J. Wise Co., Inc.

EXAMPLES OF CLASSICAL REPRODUCTION

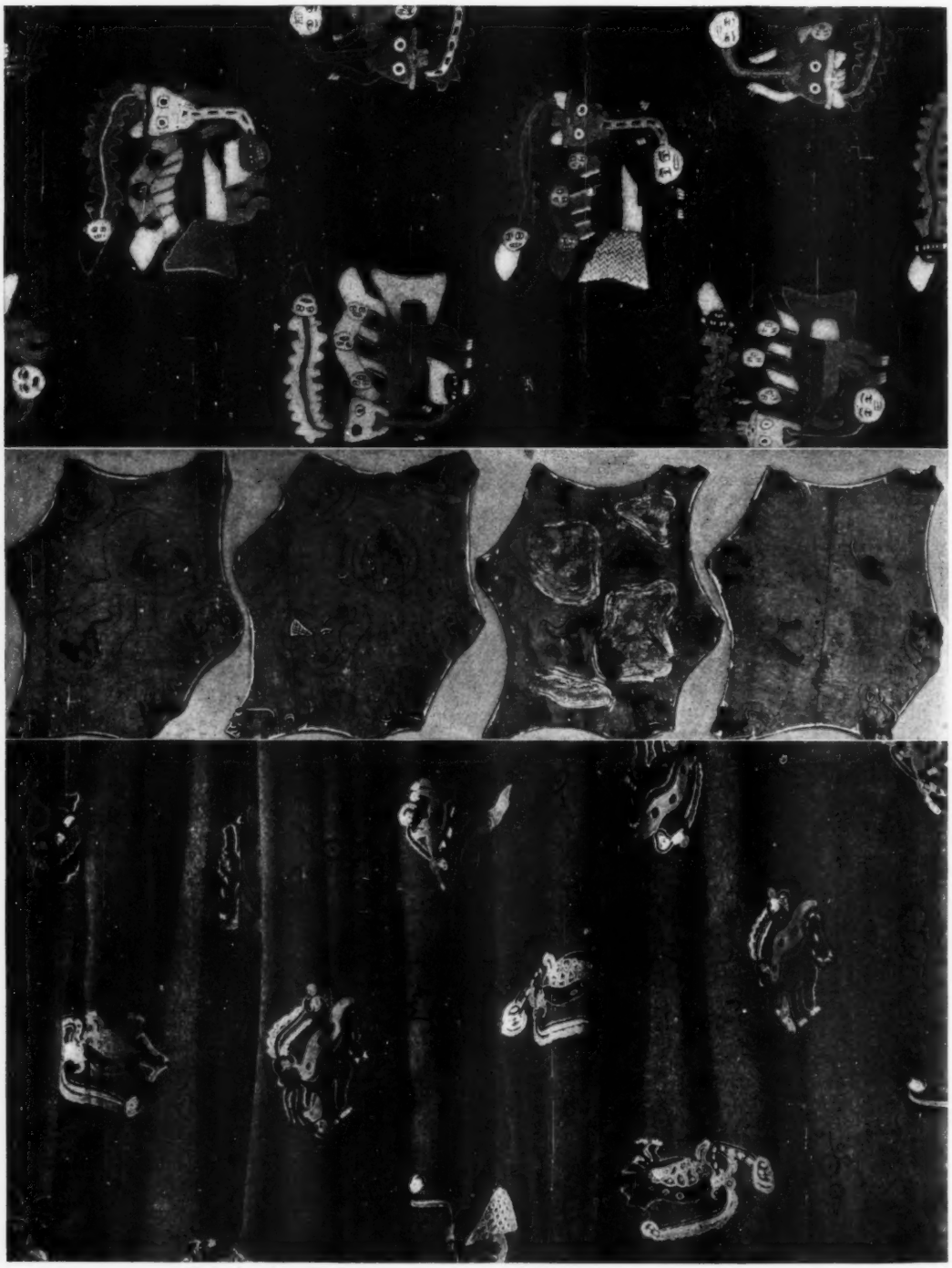
From the products of the Renaissance we may select an anthology of design that has great educational value. Particularly is this true of velvets and brocades. All the brilliancy of color and the perfection of construction that characterized the hand-loom work of Italy and France in past centuries have been reproduced on American machines

Cheney Brothers

A MODERN AMERICAN BATIK

Batik is a wax paint process making possible effects in dyeing that can be secured in no other way. It was used on ancient American pottery as well as on cloth in Java and other parts of the Far East. The decoration on this graceful gown is in the spirit of South Sea Island art

Mary Tannahill



A STORY OF ADAPTATION OF DESIGN THROUGH BLOCK PRINTING

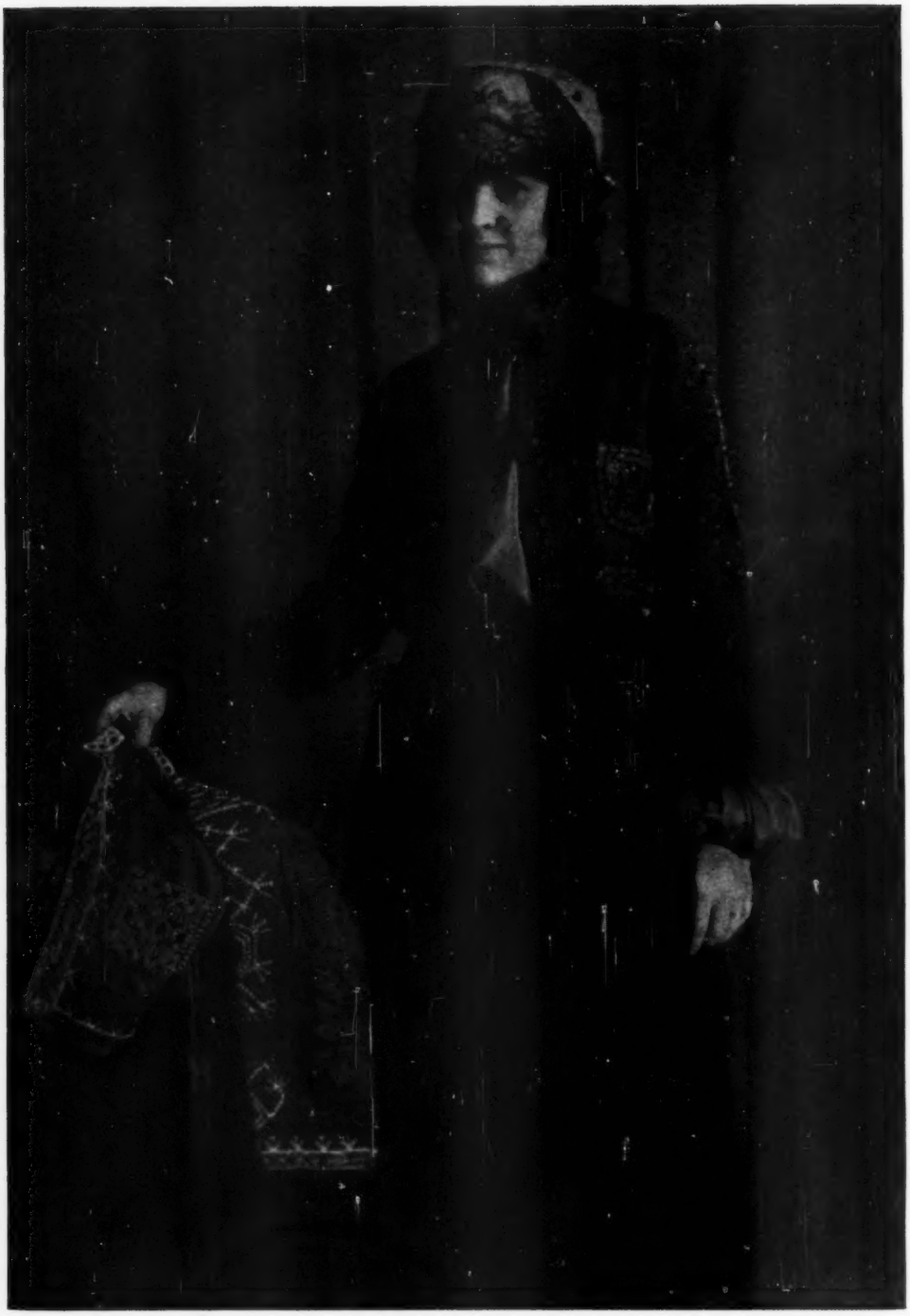
Above we see a detail of an ancient Peruvian mantle with embroidered figures in soft but brilliant colors and below a commercial use of this design. In the central strip are some of the blocks used in the printing

H. R. Mallinson & Co., Inc.

A WOMAN'S DRESS OF THE PLAINS INDIANS

The Indian women of the Great Plains wore graceful dresses made from two deerskins. The decoration by beadwork and fringes grew naturally out of the construction. The lines of construction and decoration of garments as simple as this one contain suggestions of value to modern dressmakers

Harry Collins



A COMMUNITY OF INTEREST BETWEEN NEW YORK AND THE PHILIPPINES

The Bagobo tribe of the Philippines make hempen jackets which they decorate with beads. A distinguished example showing how suggestions in primitive garments can be applied in the dress of today is seen in this graceful suit of brown cloth with decoration in brown beads. Note how the shape of the Bagobo jacket has been copied, as well as the little pockets, the strings in front that take the place of buttons, and the design that follows the edges and runs down the sleeves

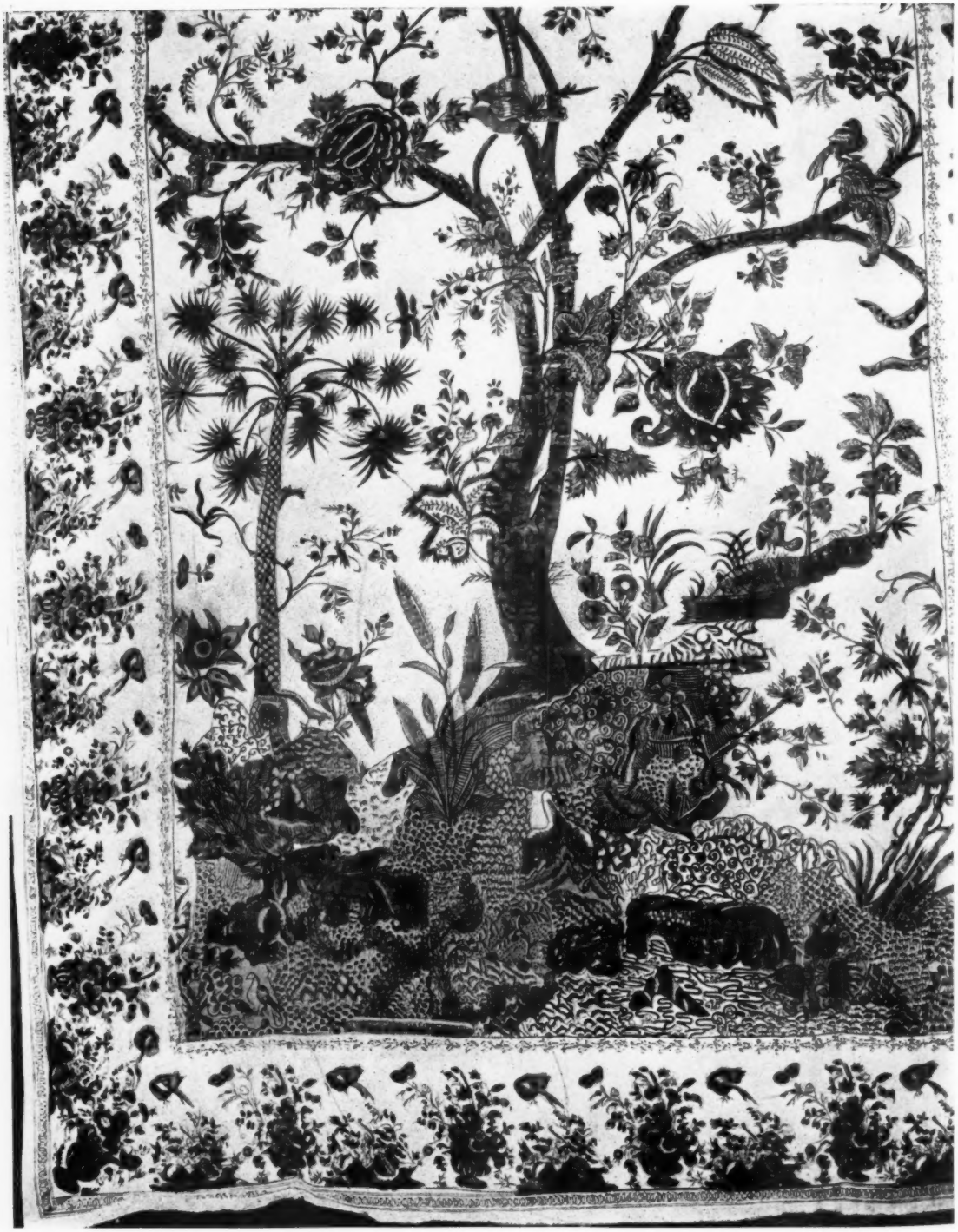
A. Beller & Co.

CHILDREN'S DRESSES

A distinct field for development is to be found in the clothes of children. Here we see two little girls wearing adaptations of Guatemalan and Philippine models. The colors are pleasing and the designs unusual.

The romance of design is one that children can understand better than grown-ups, at least in certain of its phases. Children live in a state of make-believe. Birds and beasts which never were on land or sea, but which appear in primitive designs and perform in primitive myths, appeal strongly to youthful imaginations. Geometric art gives the chords and scales of abstract beauty, realistic art pictures the things that exist in the world, while formal or conventional art, growing, as it does, out of strange religions and philosophies, results in the creation of forms that have no existence except in the mind of man

J. Wine Co., Inc.



A BLOCK-PRINTED CURTAIN FROM INDIA

Block printing and hand painting as means of decorating large surfaces in pictographic manner are finely developed in India. In the example we see a medley of more or less realistic details drawn out of all proportion to one another but with fine decorative effect

M. D. C. Crawford

An "Old Tramp" Among the Florida Keys

By CHARLES T. SIMPSON[1]

IN days gone by the only way in which a naturalist could visit the Florida Keys was by boat, but since the completion of the extension of the Florida East Coast Railway he can get off the train at Jewfish on Cross Key, tramp to Largo, Long and Windlys islands, Upper and Lower Matacumbe keys, Long, Grassy, Crawl and Vaccas keys, Bahia Honda, Big Pine, Torch, Ramrod, Cudjoe, Sugarloaf and a number of other islands of lesser importance, until he finally reaches Key West. By following the track of the railroad he will visit most of the principal islands of this interesting chain and will cross many miles of the wonderful causeway built across the sea. The stupendous arches carry a single-track railroad and are too narrow for a train and foot passenger to pass, but the company has built wooden cages hung out over the water at regular intervals along the viaduct, and the tramp can always reach one of these before the train passes.

I have been familiar with the Florida Keys since 1882, having resided in Lower Florida the greater part of the time since that date and from time to time I have made collecting and exploring trips among them. Now, although more than threescore and ten, I cannot resist the temptation to visit them occasionally in order that I may study their natural history and the geographical distribution of their life. Such a trip I undertook the latter part of October, 1919, running from my home near Miami to Big Pine Key by rail and making that island my headquarters while I visited the keys near by in a small boat. My outfit consisted of two suits of khaki—including the one I wore, an old, narrow-brimmed slouch wool hat, the best thing for getting through the thick scrub, socks, a high pair of strong canvas shoes, a coat, toothbrush, and some small sacks for holding snails. Instead of a grip, which is an awkward thing to carry through thick, tangled growth, I put my things into a large sack which I hung over my shoulder. A blanket, mosquito netting, and two-quart water can completed my stock. Fresh water can be obtained on the keys only at the cisterns of the natives or at the railroad tanks. Meager as this outfit was, it became a heavy burden when one tramped long distances on the railroad or through the scrub on a hot day.

The objects of my trip were to study the distribution of the tropical vegetation, make a list of the butterflies seen, and collect specimens of the large and beautiful arboreal snails belonging to the genera *Oxystyla* and *Liguus*. The snails were once abundant in the hammock growth of nearly all the keys but of late years are becoming scarce or are in some cases exterminated. The shells of all are highly polished; those of the genus *Oxystyla* are colored with various shades of brown; the *Liguus* are white, yellow, green, brown, black, orange and scarlet, while a few are tinted with violet or blue. All of our *Liguus* specimens have been derived from Cuba, having crossed the Florida Strait on floating timber, and are among the most wonderfully painted of any snails on earth. I wanted to observe the effects of the hurricane of early September, the one which wrecked Corpus Christi, Texas, and which had been

[1] Collaborator, United States Department of Agriculture, author of works on mollusks, especially of the West Indies and Florida, and recently of a book on the Florida Keys, their geology, and the geographical distribution of their fauna and flora, entitled *In Lower Florida Wilds*, published by G. P. Putnam's Sons.

among the most destructive of any recorded in Lower Florida; there were also two or three points in the geology of the keys which I wished to study.

The geology of Lower Florida, including the keys, is simple but interesting. During middle Pleistocene time, perhaps, a subsidence of the Floridian area occurred and all that part of the state south of the Caloosahatchee River was carried beneath the sea. A great bed of limestone was formed along what is now the southwest coast; another, an oölitic, in the Key West region, is the Key West limestone. A somewhat similar formation was laid down along the southeast coast of the mainland which bears the name of the Miami limestone. A period of elevation followed during which the land of south Florida assumed something of its present shape and dimensions, but the greater part of the Key West beds probably formed a single island. Various tropical tree and plant seeds, drifted by the Gulf Stream, were deposited along these old shores and became established as colonies, and the same was true of many different kinds of land animals which belonged to the Antillean region.

A subsidence of a few feet followed, then a second elevation in which the land of Lower Florida reached a slightly higher level than it has at present. At this time an old dry-land connection existed between the upper part of the Florida Keys and the south shore of the mainland, over which plants and animals migrated. The upper part of the chain of keys is a worked-over coral reef which formed outside the shore of the Miami limestone country and it extends from near Cape Florida to the Newfound Harbor keys which come to an end south of Ramrod Key. The curious tail of land which forms the lower part of Big Pine Key is a part of this coral reef and is connected with the main island of Key West limestone by an irregular mud flat.

During the two subsidences, the eastern end of the Key West island was depressed so that the water of the Gulf of Mexico was driven across the lowest parts of it into the Florida Strait during severe northers, thus scouring out channels which have a north-northwest, south-southeast direction, leaving long, narrow islands between them. The tides are high in the gulf at the time they are low in the strait and *vice versa,* hence they continually scour out these passages and eat away the limestone by means of the carbon dioxide which the sea water contains. The upper and lower islands are thus of entirely different origin. That the upper are much the younger of the two is proved by the fact that, although the dry land of the two groups is nearly equal, the flora of this upper group is meager in species while that of the lower islands is very rich, the latter having more than 175 forms not found on the Upper Keys.

The latest earth movement of this region was a slight subsidence which has been sufficient to submerge and partly destroy the old land connection between the Upper Keys and the mainland. At no time since the present life has existed in this area has the subsidence been sufficient to drown out the dry-land flora and fauna, nor has the elevation been great enough to form a dry-land connection between the upper part of the chain and the Miami mainland. Although the elevated land of some of these islands lies within eight miles of the high, rocky east coast, the floras of the two regions are quite distinct, and there is a slight difference in the faunas of the two areas.

For several days I made my headquarters on Big Pine, making cruises to the neighboring keys in a row boat propelled by a big, good-natured Bahama darky. The hurricane had wrought terrible havoc in these islands.

During its continuance the wind blew from nearly every point of the compass and it drove the water of the sea high up over the dry land everywhere. Along the railroad, between Big Pine and the West Summerland keys, it broke over the tracks which are perhaps eleven feet above the level of ordinary tide, piling débris up on the side of the roadbed to several feet above it. Houses were torn down or drifted away, trees broken or uprooted; in places the seashore was encroached upon, and in others sand and débris were built far out into the sea. Every conceivable kind of drift and rubbish was carried far in on to the dry land. In well-elevated hammocks there were millions of tropical seeds, washed in perhaps from Cuba or the Bahamas and mixed with broken wood, trees, and bark. This material lay in drifts and immense beds, and already many of the seeds were sprouting and coming up—the forerunners of colonies of imported plants.

No finer lesson could be given of the manner in which our tropical flora has been planted and established, and it is in just this way that the work has been done in past ages. The land mollusks of the West Indian region which are now inhabitants of Lower Florida together with some other members of the animal kingdom have been carried in and established in much the same way, arriving on floating timber which has been carried inland on tidal waves. The splendid *Liguus,* for which I was searching, lives entirely on the trees and lays its eggs in the ground or in decaying wood on the floor of the forest. Both animals and eggs sink in sea water but the former may be transported while clinging to the trees on which they live and the eggs may be carried in the rotting wood which is washed into the sea during great floods. The snails are not injured in the least by immersion in salt water even for many hours, as I have ascertained by experiment, and the eggs suffer no harm from a sea bath.

My entire search of the lower islands resulted in finding nothing more than a few broken and faded shells of *Liguus* and *Oxystyla.* On one of the exposed beaches a considerable number of fragments were washed up and some of these still showed the characteristic color of the shells belonging to these islands. But it seems probable that both of these genera of splendid snails are now extinct on the Lower Keys.

My next run was to Marathon on Key Vaccas. This island is invariably called "Key Waccy" by the natives. Outside of Boot Key Harbor and Marathon, it is inhabited by a few Bahama Negroes who live by fishing, turtling, sponge gathering, and charcoal burning. They are a peculiar people who do not seem to relish having the whites come among them. Their speech, which is little changed from that of the Bahamas, is sometimes difficult to understand. The letter "a" is pronounced as it is in the word "what," and there is a peculiar monotony in their conversation.

Five years before, when I had visited the island, I met an old darky by the name of William Lowe, who told me he had seen *Liguus* on the trees in some hammock land which belonged to him. Questioned more closely, he said he had seen the "black snail," as a certain very dark-colored variety of *Liguus* is called, in this forest. I had hired him to make a half-day search and he found a single living specimen. When I left him he promised to keep a diligent lookout for this variety or any others whenever he had opportunity. Although this dark form was formerly abundant and by diligent search I had found about fifty dead specimens, I had never taken it alive. So far as I know, it is now to be found only in this island, although it once existed on Cape Sable, at Chokolaskee among the Ten Thousand Islands near

Miami and on one or two islands in the lower part of the Everglades. I made my way to Lowe's house and was told that he was in the field at work and would be home at night. When I asked Mrs. Lowe if I might stay all night she refused, and said I would have to talk with her husband. I sat on a stump in the little yard, tormented by mosquitoes and sand flies until dusk when he appeared. He didn't seem to remember me, although I had written to him that I was coming and wanted him to help me collect. All the people in the little settlement apparently resented my presence and made me feel that I was anything but welcome. When I asked Lowe if I might stay all night he replied very emphatically that I could not, and he also said in answer to my inquiry that no one about there would keep me. He wasn't even willing that I should sleep on the floor of his little cookhouse. I asked him if he intended to turn me out to sleep in the rain, for a steady downpour had set in. He at last reluctantly permitted me to come into the house. It was a little better than most of the dwellings of the natives, being in size about 14 by 20 feet, with board sides and a shingled roof; a narrow hall, not more than three feet wide, ran from side to side of it, and dark ill-smelling little rooms or cubby-holes were partitioned off in the rest of it.

I determined to get into the good graces of these people if possible, and began to tell them of my adventures and mishaps. I wanted to get them interested and to have them become friendly, and I hoped to have their assistance in collecting. Soon Lowe began to listen in an interested way and I could hear the women, who had crawled into one of the little rooms, laughing; two or three neighbors came in and stood in the smoke of the everlasting smudge pot and eagerly listened. Finally Lowe got up, unlocked a door opening into one of the rooms and from a shelf brought out a Mason's fruit jar and unscrewed the top. To me, although the odor was nauseating, the sight was thrilling, for it was nearly full of dead specimens of *Liguus* and *Oxystyla* which he had captured from time to time and shut up in this glass prison. Among them I saw some specimens of the black snail which I was so eager to obtain, and when I asked him if the lot was for me he replied, "Yas, sah, w'en you pays me foh dey." I offered to give him the money then but he was not ready to take it and he wouldn't even allow me to take the jar in my hand.

I wanted to get him to collect for me the next day but he said he had a charcoal pit on hand and couldn't leave it under any circumstances. Finally after some dickering, when I offered him a price that would have tempted a striking union labor man to go to work, he scratched his head and said, "Maybe I can fix dat pit so she go ovah one day, and den I he'p yo'."

I rolled myself up in my blanket and lay down on the floor at bedtime in one of the dirty, awful-smelling little dens. Lowe shut the doors; the windows, which are of boards, are always closed at night. I asked him if I might open the window in my room but he was not willing. Twice in the night, however, when nearly suffocated I got up and quietly pushed it open while I gasped in a few breaths of fresh air.

In the morning I went with the old man to the hammock and he seemed to be in an excellent humor. "Mans in dis islan'," he said, "gwa' cut down timbah an' Ah tell him yo' pay him good money foh any of dem tree snail. He fine some of dey and pick dey off an' lay dey on de groun' 'side he coat an' he t'ink he get dey w'en he go home at night. Well, sah, w'en he go dare at night dey ain't no snail dare; Ah reckon dey half mile away, up in de tree likely laughin' at him." And he threw back his head and shoulders and laughed, "Yah kya

kya kya!" until he fairly made the woods ring. "Ah reckon he t'ink dem snail gwa' to lay dare and wait till he get ready to come an' git dey. Yah yah yah yah!" And he laughed again uproariously.

We hunted together for several hours with the result that he found four of the black snails, two of which were dead but in good condition, while I got none. I asked him how it was that he could see them so much better than I, who had been used to hunting for them so long, and he said, "Ah reckon it 'ca'se I been bohn an' bred in de scrub, sah." No doubt this was the reason. The eyes and other sense organs of men who habitually live in the wild are much sharper than those of any one whose abode is within the pale of civilization. Such persons live in a great degree by the use of the senses while the man of civilization lives by his wits.

While on the island I took a long tramp to its upper end, then over to Little Vaccas, an unnamed key, also to Lower, Middle and Upper Crawl keys, but though I made diligent search everywhere, I found but few *Liguus*. On my way back I went into a piece of fine, original hammock near the upper end of Vaccas and found a magnificent orange-colored variety. Some of the shells were superbly shaded and stained with scarlet and I collected until night was coming on. Near a little pool in the hammock a water moccasin, which was partly concealed under a palmetto leaf, struck viciously at the inside of my left leg as I was walking forward. I happened to carry in my hand a stick about four feet long and less than an inch in diameter, which I used to push off snails from the trees. Instinctively I struck at the snake as it lunged at me, and hit it a sharp blow on the "neck." This knocked it to the ground, but the force of its stroke was so great that its head shot on between my legs.

It seemed to me that all the darkies in the settlement gathered at Lowe's house that night to hear my adventures, with the result that they all became quite friendly. Next morning old boxes and corners were searched in all the houses and a number of fine *Liguus* and *Oxystyla* shells were brought to light which their owners sold to me at a good round price. Lowe got me a box to pack my shells in and accompanied me to the railroad, carrying it for me. When I bade his wife good-by she said, "Boss, we shorely miss yo' tonight," which I felt was a very high compliment.

I next visited Long Key and found a fine piece of rocky hammock near the flag stop called Crescent, but although I searched it diligently for several hours I did not find even a fragment of a *Liguus*. Then I went on to Upper Matacumbe and was fortunate enough to be taken in at the home of a Mr. Lee Pinder at the village of Matacumbe. The room which I occupied faced on the open sea and to me it was a paradise after the miserable den I had recently occupied. I tramped to the southwest end of Lower Matacumbe Key and back one day, a distance of more than sixteen miles, and searched the island carefully but found only a few living snails. Another day, Mr. Pinder took me to Lignum Vitæ Key in his launch and we spent several hours searching for snails with rather meager results. Formerly *Liguus* swarmed on this island but it seems as though some cause besides the encroachment of civilized man is acting to exterminate these beautiful snails. Very little of the fine hammock has been cut and no one lives on the island.

I tramped up the railroad track from Matacumbe and crossed over to Windlys Island which has the distinction of being the loftiest of any of the entire chain of keys. Two little knolls near its eastern end rise to a height of about eighteen feet above the sea and in so flat a region they seem like small

mountains. To the left of the flag stop called Quarry, I noticed some fine, lofty hammock at a little distance and, although I had searched it through without results several years before, it looked so tempting that I hid my belongings by the railroad track and pushed through the tangled, thorny scrub until I reached it. Tramping through it I saw again the very rare West Indian tree *Hypelate trifoliata,* or white ironwood, which is not known to exist elsewhere in the United States.

I searched the tall trunks of the trees diligently for two hours but saw no snails, so at last I turned toward the railroad and concluded there were none. As I went back I saw at some distance high up on a tree something which looked a little like a white *Liguus,* but it seemed to be altogether too large. I hurriedly made my way nearer to it, and saw to my astonishment an enormous specimen which, although it was more than thirty feet above me, I was sure was the largest I had ever seen. I at once set my wits to work to study how I might secure it. I could not possibly cut with my knife any pole that would reach it, neither could I handle such a pole if I had it. Mr. Pinder, who had been with me to Lignum Vitæ Key, was very expert at throwing chunks of wood, and he could strike a lofty limb and loosen a snail nearly every time, but I am a poor thrower. I might hit the side of a barn if it were not too far away and the wind was favorable, but that is about all. Besides, if loosened, the shell would most likely be broken by falling on the rocks below. The only thing to do was to climb for it, but much of the way the trunk of the tree on which the snail was fastened was bare of limbs. I dragged a dead trunk of a sapling and leaned it against the tree so that by working up it I could reach the lower branches which extended along the trunk for perhaps ten feet. Then, at a distance of about six feet above these, a stout limb grew out which had been broken off a foot or more from the trunk by the hurricane. If I could only get up and stand on this broken branch it seemed to me that I might reach the snail.

I cut out with my big pocket knife the top of a small live tree which the storm had overthrown. It had two strong branches about two feet apart near its base and I believed I could use them for steps. I trimmed up the somewhat slender main shoot and carefully bent it in a loop, tying the upper end to the stem below, and when my "contraption," as Uncle Remus would have called it, was finished, it looked something like a gigantic sixteenth note or semiquaver. At one of the platforms along the railroad I had found a long piece of stout string and I tied one end of it to the contrivance and the other to my suspender and commenced my ascent of the trunk of the sapling I had leaned against the tree. When I got up about six feet above the rocks this dead trunk broke and I fell with a crash but was not much hurt. Then I cut off the only root which held the little tree that had been overthrown, dragged it up, and leaned it against the tree bearing the snail. Although it sagged it bore me and soon I was among the branches, and stood on the topmost one. I pulled up my ladder and hung the loop of it on the broken limb, securely tying its base to the trunk, then I carefully worked up by stepping on the rungs until I stood on the broken limb.

But I had miscalculated the distance and I found that I could not reach the snail by more than three feet. Must I give it up after all that trouble? I wouldn't push it off and let it fall for I was certain it would be broken. It looked so large and handsome that I determined I would try to shin up to it. Shinning a tree is pretty good exercise for a young fellow but for a man nearly seventy-four and weighing more than

175 pounds it is a good deal like hard work. I slowly worked my way up and whenever I was completely exhausted I rested, clinging tightly to the tree, while the sight of the great, glittering jewel above my head tempted me to make further efforts. At last by reaching far out I could just touch it; then one more tremendous struggle and I held it in my hand. I carefully loosened it, put it in my overalls pocket, and in less than a minute had slid to the foot of the tree. Then I took it out; I fairly shouted and capered about like a boy; I rubbed it against my cheek and talked foolishly to it. No miser ever gloated over his gold as I did over that magnificent snail. Years before I had found on a shell mound back of Chokolaskee in the Ten Thousand Islands a *Liguus* which until now was by far the largest I had ever seen. Sometime during its life this specimen had had a quarter of an inch of the tip of its shell broken off and it had soldered up the opening. But even with that, when I came to put it beside my Chokolaskee shell, this was longer, more solid, and had greater diameter. Counting in the broken part, my new shell is exactly three inches in length and one inch and nine-sixteenths in diameter. It is a glossy ivory white with faint bronzy green, revolving lines, which are more distinct on its base, and it must be about seven years old, a veritable patriarch, since most of our *Liguus* do not live more than three or four years. This magnificent specimen amply repaid me for all the hardships of my trip.

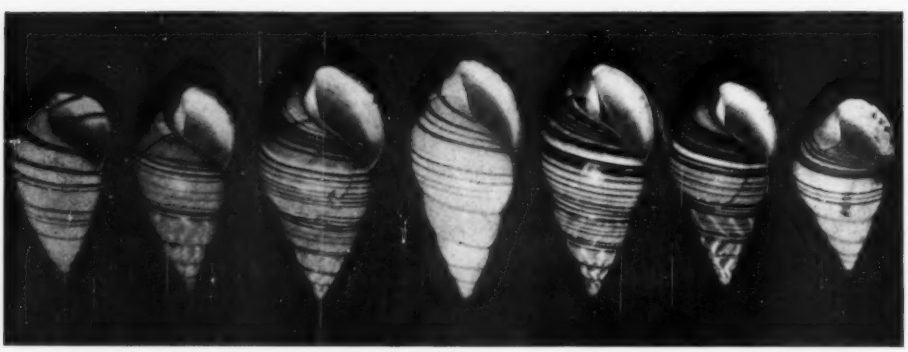
From Windlys Island I worked my way along the railroad through Long Island and into the great Key Largo which has a length of nearly thirty miles, and at the little flag stop called Keylargo I took the train for home.

The greater part of the original forest of the keys has been cut—that along the upper part of the chain in order that pineapples might be planted. As soon as the roots of the trees decayed, most of the soil which covered the fields was washed down through the loose rock, and pines would no longer grow on it. Then the hammock sprang up again, this time a scrubby growth, filled almost solid with thorny trees, shrubs, and vines. In most places it is so dense that one cannot work his way through it and it is possible to progress only by hunting out the more open parts of it. The heat is almost intolerable and mosquitoes and sand flies swarm everywhere during the wetter part of the year. Most of the few residents are poor and live in small, badly constructed shanties. It is difficult to get entertainment, even the privilege of sleeping under a roof, no doubt because of the number of tramps and bad men who are found on the keys. But the whole region possesses a peculiar charm; it is a bit of the tropics, it has a rich and interesting vegetation which, with its rather meager dry-land fauna, presents some remarkable problems in geographical distribution and evolution. During the winter there are comparatively few annoying insects, the sky is marvelously clear and beautiful, the few clouds have a summery look, and the water is lovely with a hundred tints of green and blue. A vast marine fauna literally swarms in the seas, and for the naturalist no more attractive region exists in the United States.

Everywhere I went I was taken for a tramp—my appearance no doubt helping to create this impression; but in every place I stopped I was able to convince some one that I was all right. One evening I tramped into the little village of Plantation and applied to a woman at a decent-looking house for a night's lodging. She told me to go away and shut the door in my face. At another house the women ran in, but by persistent hammering on the door one of them came and told me that no one

in the hamlet would keep me, that a short distance down the beach I would find a house. I hid my bag and walked a half mile along the shore to find no house and concluded that she expected me to sleep in the sand. When I came back I spoke to an elderly man who stood in a door and asked to be allowed to sleep on his floor. He refused to let me come in and didn't want even to converse with me. Finally I asked him if he thought I was a tramp and he said he did. I pulled out a gold watch and asked if tramps carried things like that. Then I took out a roll of money and said, "Do tramps carry this?" His severe scowl changed into a smile and he said, "Oh, come in, I guess you are all right." He gave me a good supper and breakfast and we parted the best of friends. As I left he said, "I'll tell the folks here what a fine visit I had with the 'old tramp.'" At a little flag stop where the postmaster sold railway tickets I asked for one to a neighboring station, and the man said, "Have you any money?" I handed him a twenty-dollar bill and in surprise he said he couldn't change it. Then I counted him out the exact amount and told him that he mustn't always judge people by their appearance.

My trip was a complete success for it enabled me to solve several problems that I had puzzled in vain over before going. I added not a little to my collections and as usual found things in places where the books said they should not grow. All the scrub was glorious with flowers—I have never seen such an array in the tropics. Two *Echites,* vines closely related to the oleander, had glossy leaves and charming flowers, the one sulphur-colored, the other rich yellow, and both should be introduced into cultivation. There were masses of a yellow-flowered *Cassia* and acres of a lovely morning glory with great purple, blue, or pinkish salvers. In the scrub its slender, half trailing, half climbing stems catch and trip whoever ventures into it, but whenever I gazed on its splendid masses of bloom I forgave it. In the early morning and late in the evening the moonflowers were as conspicuous as their blue-flowered cousins, the morning glories. Such tramps bring one into the closest contact and communion with nature, and renew one's health and vigor.



Tree snail shells (*Liguus fasciatus,* about one half natural size) from the collections of the American Museum of Natural History

Island Animals and Plants

THEIR CONSERVATION IS URGENTLY NEEDED

By WILLARD G. VAN NAME

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ALTHOUGH the animal and plant life of small islands and of island groups, particularly of those which are more or less remote or inaccessible, is characterized by the presence of fewer species than on the mainlands, these species are often peculiar and strictly limited in their distribution, or of especial interest to science for other reasons.

Islands have in many cases been the last refuge of species of animals and plants which were unable to maintain themselves against the more numerous enemies that beset them on the continents. Sometimes the islands have preserved some survivors of forms which used to inhabit larger areas of land, now submerged under the sea, a remnant of which the existing island represents. The more or less complete isolation of animals and plants living on islands restricts or altogether prevents their interbreeding with members of their species from other regions, and the variations they may develop from climatic or other causes may become fixed and permanent, resulting in the formation of the new species found nowhere else. Such islands often afford exceptional advantages for observing the processes of evolution, as the factors affecting these processes in such isolated species are often fewer and simpler than on the continents. There is no doubt that Darwin in developing his theory of evolution was influenced by the observations of island animals and plants made during his earlier years as a naturalist.

The relationships existing between the creatures inhabiting the various groups of islands and those of other regions, and especially the presence or absence of terrestrial forms which could not easily cross wide stretches of water by any natural means, disclose facts about the geography of past geological periods and aid in determining when and where former land areas now submerged must have existed. In this way they have afforded a valuable check on the conclusions arrived at by geologists by entirely different methods, for while they indicate that many existing islands were formerly a part of some continent or of a much larger island, they lend no support to fantastic theories of vanished continents or former land connections across what are now extents of wide and deep ocean. Added to all this, the strange character and, in many cases, the great and increasing rarity or the recent complete extinction of some of these creatures lend interest to them from a more popular point of view also.

It is not only distant oceanic islands that possess such interest, since even those close to the shores of continents occasionally have certain peculiar species not found anywhere else, or they may afford, through their comparative inaccessibility and freedom from predatory mammals, safer breeding places for animals such as seals or sea turtles, or ground-nesting sea birds, than can be found elsewhere. There is no question that, but for the breeding places provided by the islands off the Atlantic coasts of the United States and Canada, many of our sea birds such as the gulls and terns and members of the auk family would by this time have been practically exterminated from this part of the world. The gannet, for instance,

one of the largest and most beautiful of our sea birds, now breeds on this side of the Atlantic in two island colonies only, both much reduced from their former size; fortunately these colonies have at length been taken under the protection of the Canadian government. On the coast of southern New England, the breeding colonies of terns and laughing gulls on Muskeget and a few other more or less inaccessible islands were able to persist during the years of persecution to which these birds were subjected for the millinery trade, and have served as centers of distribution for repopulating other parts of our coast with these beautiful species, now that protection is given them everywhere.

The survival of the heath hen on Martha's Vineyard is another striking example, while the development of a species of sparrow, the Ipswich sparrow, which appears to be confined in its breeding entirely to Sable Island south of Nova Scotia, although it migrates in winter to the mainland, affords an instance near home of the tendency of insular life to result in differentiating new species.

In another respect Sable Island, just mentioned, is of interest, for although it is but little farther north than Portland, Maine, its shores were in the early days of the settlement of America still inhabited by a herd of walruses, the most southern colony of that species of which we have any historical record.

Forty miles off the coast of Lower California, not very far south of the United States boundary, is a small island, Guadaloupe, remarkable in much the same way. It was probably the last home of an extinct species of fur seal, and possessed three or probably four peculiar species or very distinct varieties of land birds that have recently become extinct. But its chief interest lies in its being the last stronghold of the California sea elephant, closely related to the sea elephant of the southern hemisphere. This animal formerly inhabited the coast of the mainland of southern California, as well as Lower California. It was supposed to have been entirely destroyed, when a small herd of about one hundred individuals was found still in existence in 1911 at Guadaloupe Island, so that even at that recent date, it would still have been possible to save this remarkable animal from extinction.

Unfortunately the rapid increase of human population and the commercial expansion during recent times, and especially the development of rapid and convenient transportation, have put an end to the immunity of these places from occupation or at least from frequent visitation by the most destructive enemy of nature that this planet has ever seen—civilized man. As a result, hundreds of the forms of animal and plant life peculiar to them have already become totally extinct, and each year that passes adds more to the list. Some of the most beautiful of the birds of paradise are of very restricted range and have become nearly or entirely extinct because of their slaughter for the millinery trade. Members of many groups are on the list of extinct or threatened species, especially birds, reptiles, land mollusks, insects, and many trees and smaller plants. Their remote and isolated homes protected them against their natural enemies but do not avail against the unnatural ones that now beset them.

Our own Hawaiian possessions afford a good example of what is taking place on many island groups. The native land birds of Hawaii are remarkable for the large proportion of peculiar species and genera found in no other part of the world. A recent writer[1] states that "Due to the operations of various malign influences, the native forests and birds have greatly diminished within historic times.

[1] MacCaughey, in *The Auk*, January, 1919.

Many known species of plants, trees, and birds have become wholly extinct, and many others are on the verge of extinction. A time is speedily approaching in which the extinct avian species will exceed in number those still surviving." Farther on he says, "Oahu has been more completely despoiled of its native bird life than any other of the larger islands. More of the known Oahu passerine species are extinct than are living today. The Oahu elepaio [a small flycatcher] is the most abundant of the remaining native birds and is practically the only species commonly seen."

That this unpromising outlook is no exaggeration is proved by many other writers and observers. A study of Rothschild's account of the birds of these islands, although published nearly twenty years ago and based chiefly on collections and observations of considerably earlier date when conditions were better than at present, records 7 of the 70 indigenous birds considered peculiar to this group of islands as already certainly extinct, and a number already very rare, known, in spite of extensive collecting, by but very few specimens, while of the remainder only a comparatively small minority were widely distributed and common on one or more of the larger islands. The Hawaiian Islands are characterized also by the great number of land mollusks, one family, the Achatinellidæ, being almost restricted to those islands and differentiated into a large number of species, some of them of extremely local distribution. Many are entirely extinct and others are becoming very uncommon.

A species restricted to one or more small islands for its habitat is at a disadvantage for many reasons some of which can easily be recognized:

First, because island species usually comprise but a small total number of individuals, even though being crowded on a small island may make them appear abundant. If many are killed it means a seriously large percentage of those in existence.

Second, some catastrophe, perhaps a natural one such as a volcanic eruption, but more often one in which man has some complicity, may wipe the entire species out. An example of this is the destruction of the greater part of the race of heath hens on Martha's Vineyard (which under careful protection had been increasing in numbers) by a single forest fire in May, 1916, so that the total extinction of the species is now probably only a matter of a short time. In the case of widely distributed species this could hardly happen. But if the breeding places of a species are restricted, even though it ranges widely at other seasons, it is exposed to the same danger. The Galapagos albatross breeds only, so far as is known, on Hood Island of the Galapagos group. If this breeding colony were destroyed we cannot be sure that another would be successfully established.

Third, a species confined to a small island has no place to escape to from enemies which it cannot resist, or from the destructive changes, such as deforestation, that man may bring about. On scores of islands, human occupation has been followed by the destruction of every bit of the former forest growths, in many cases resulting in the complete extinction of some of the trees and other plants composing them, and of the birds and animals peculiar to them and dependent on them for food and shelter.

Fourth, the advent of man is invariably accompanied by the introduction of destructive animals, especially domestic cats, rats, dogs, hogs, and goats, and in warm climates often of the mongoose, to say nothing of noxious insects, weeds, and disease germs accidentally imported. The species thus introduced are apt to have many advantages over the native ones. They

are forms which have lived for long periods in association with man. The wild species among them know his habits; they do not fear him unnecessarily, understanding how to take advantage of the results of his labor, while evading the consequences of the hostility that their depredations cause; the domestic species benefit by his care and protection. They are vigorous and prolific creatures. The changes in the condition of the land brought about by clearing and cultivation make the environment more and more suitable for them as time goes on, but less adapted for the native forms. Moreover, among the new arrivals there are apt to be some that find their new home peculiarly well adapted to their needs, so that they increase to an extent that crowds other species practically out of existence by the mere effect of their numbers, and by their consuming the available food supply, even if they are otherwise harmless. This is especially the case when domestic animals are allowed to run wild in such places. It was a common thing in the early days of navigation to stock uninhabited islands with cattle, goats, or hogs, so that ships visiting them for water could also get a supply of fresh meat, an item of no small importance when voyages were of indefinitely long duration and cold storage was as yet undreamt of. The literature of many of these islands is full of references to the deforestation and other damage that these animals caused.

Fifth, as the number of individuals in a species becomes reduced, inbreeding becomes unavoidable, and its well-known weakening effect makes the long survival of the species impossible. If an animal is to be saved, protection must be given before its numbers become too small. Laysan Island, an outlying member of the Hawaiian group, possesses among other peculiar birds a species of duck, the Laysan teal, found nowhere except on this one small island. Fisher, in 1902, reported this species as reduced to fewer than one hundred individuals. Bailey, in the April-May, 1919, number of NATURAL HISTORY, reports it as reduced to seven. Even if among these seven individuals there are members of both sexes that can breed, it is inevitable that the species will soon die out from the effects of inbreeding. It is inbreeding that is likely to make the permanent preservation of the heath hen impossible, unless it may be found practicable to introduce the necessary new blood by crossing with a few individuals of the prairie chicken of the western states. The two species are fortunately so closely allied that crosses in all proportions would probably be fertile, and any changes in plumage or other visible characters produced by the crossing would probably soon breed out. Such an experiment seems well worth trying, as it appears to offer the only possibility of preserving the heath hen.

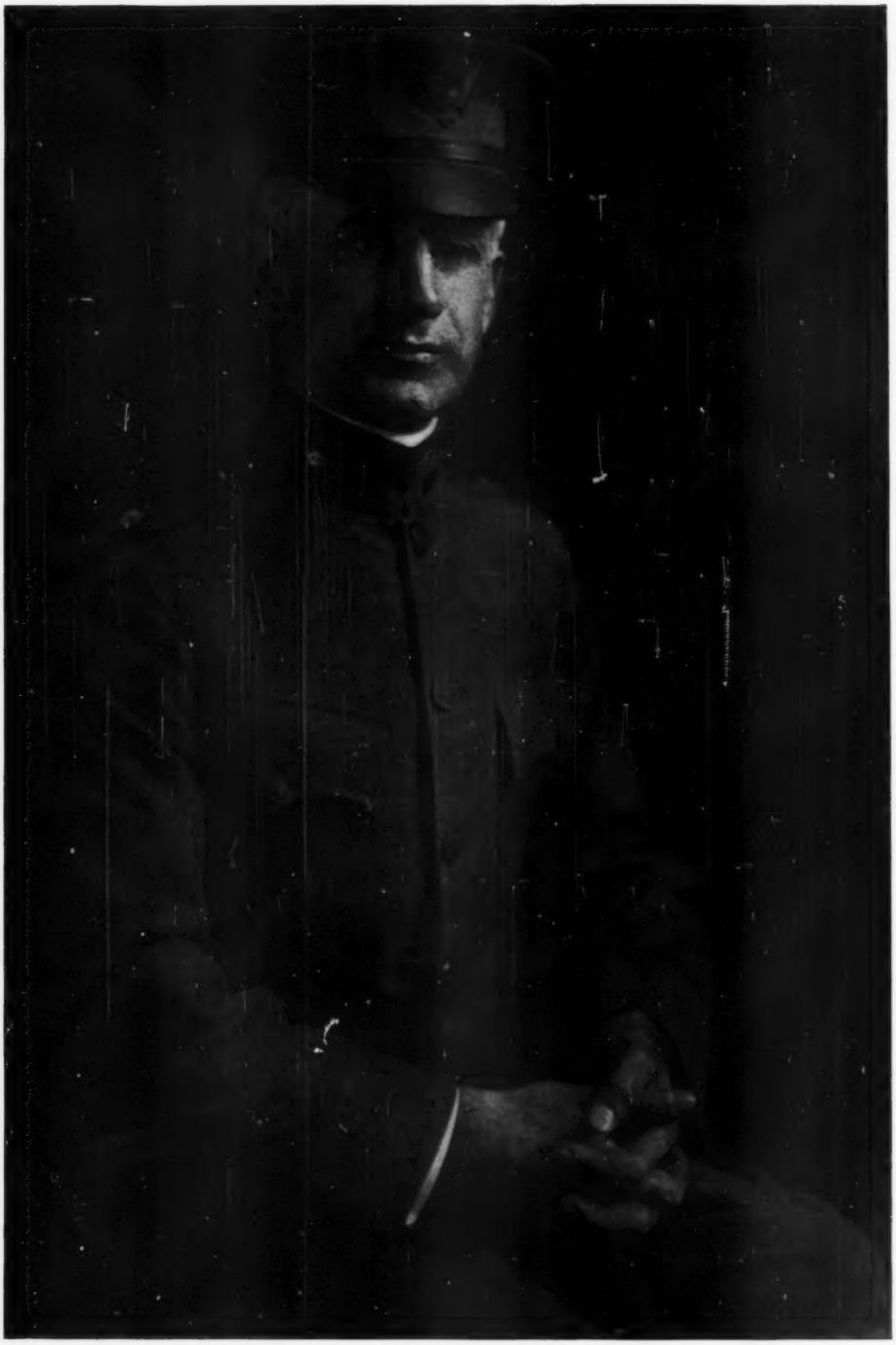
Last, but by no means least, life in the more uniform and protected environment of islands, produces in course of time a lack of adaptability in the species to endure changes or to resist new enemies, and may result in the loss of certain powers and functions through their disuse. Some of the birds for instance, having only short distances to travel and few enemies to escape from, have more or less completely lost the power of flight. Such retrogressive changes are not physical only but also mental. Compare, for instance, with the clever resourcefulness of the crow and the red fox, which maintain themselves in thickly settled districts in spite of man's hostility, the stupid tameness of the dodo and Steller's sea cow described in contemporaneous accounts, or the senseless timidity of certain small native Hawaiian birds of which it is said, though probably not without some exaggera-

tion, that they are afraid even to cross a road cut through the forest, and remain always on the side where they happened to be when it was built.

We cannot expect that among the small population of remote islands there will be many influential people with a taste for scientific or popular natural history, or with any appreciation of the unique character of the native plants and animals and a realization of the urgent need for their care and protection—although few communities are now without some persons with such interests. But if these peculiar island species are allowed to become extinct through neglect and indifference, it is not merely a matter of local concern; it is also a loss to science and to scientific men, and to all with an interest in zoölogy and botany, scientific or popular, throughout the world; a loss that cannot be repaired in the future and that will always be a reproach and a discredit to the present generation.

Our Government and our scientific societies should see to it that on our own island possessions at least the rare and disappearing species are given every care and protection, but the matter is such an urgent one and of such importance to science that the duty should not be considered as limited by political boundaries, and we should regard it as a proper ground for international coöperation, or for assisting those even in foreign possessions who need encouragement or help to enable them to carry on such protective work. Even if we regard science as such a lofty and transcendental conception as to be indifferent to the mere extinction and annihilation of the most interesting part of the material with which it deals, the information about the life, habits, food, and reproduction of these vanishing species that would be acquired in a serious effort to preserve them would add to our knowledge facts that must be studied now or never. Neglect of this plain duty and of this last and only opportunity will be a cause of regret in the future.

The whole subject of conservation is one that must receive greater consideration than that which has yet been conceded to it. We too often dismiss it from our minds, and silence our consciences with the thought that it can be dealt with by the Government or by other people who have not sufficient troubles of their own. That we ought to do as little damage to the world and to nature as we can during our brief stay here, and that we should leave for those who come after us some of the natural resources and as many as we can of the wonderful and interesting animals and plants and the other beautiful objects in nature which we enjoy, instead of turning the world over to them in the condition of a squeezed lemon, is a doctrine too seldom taught in our schools or colleges and too rarely preached in our churches. But after it is too late—and that time is now not far ahead—there is likely to come a realization that the greatest mistake ever made by the human race was not to have taken that idea as the foundation of its code of ethics and conduct.



MAJOR ROBERT M. YERKES

Lately Chief of the Division of Psychology, Medical Department, United States Army

Line of draftees entering the psychological examining building for intelligence rating

The Army Intelligence Tests

By GEORGE F. ARPS

Professor of Psychology, the Ohio State University; lately Major, S. C., U. S. Army

WHEN the internecine struggle of 1914 drew this nation into the vortex the American Republic was confronted with an emergency of such proportion as appeared likely to require the services of every phase of modern science. That psychology, in many respects the most youthful of the applied sciences, was able to place at the disposal of the Government a technique whereby a fairly accurate mental measurement could be made of each raw, problematical recruit, is but a striking illustration of American resourcefulness, originality, and initiative. It is likewise an effective commentary on the relative merit of American versus German points of view in the problem of human behavior.

A workably accurate scientific classification of brain power of the manhood of the Army would not only enormously abbreviate the period of organization, but also make possible a wise expenditure of this power and thus prevent wastage of material resources as well as man power. It has been the writer's experience that commanding officers are everywhere and always eager to adopt any technique or method which will enable them to discover native resourcefulness and utilize it in positions of leadership and responsibility. It is equally important to discover those so low in the scale of intelligence as to constitute a menace in the use of firearms and to the success of any military undertaking.

In recognition of these clearly desirable ends the Medical Department of the Army, in August, 1917, accepted for trial the details of the technique, methods, and procedure prepared by the Committee on the Psychological Examination of Recruits, whereby a mental classification of all recruits could be made shortly upon arrival in the various cantonments. The trial results led the Surgeon General of the Army to recommend to the War Department the extension of intelligence examining to "all company officers, all candidates for officers' training camps, and all drafted and enlisted men."

Early in 1918, the War Department approved the recommendation of the Surgeon General and created the Division of Psychology in the Sanitary Corps of the Medical Department for the purpose of carrying into effect the psychological service.

Group of literate draftees taking ALPHA intelligence test

Scoring ALPHA examination papers. By means of stencils it was possible to score the papers almost as rapidly as succeeding groups were examined. Commanding officers received the results within twenty-four hours after examination

Psychological Personnel

Upon the creation of the Division of Psychology in the Medical Department, about one hundred officers and three hundred enlisted men were mobilized at Camp Greenleaf, Georgia, in the Medical Officers' Training Camp, and there given intensive military training, instruction in the technique and methods of psychological examining, army paper work, and such other instruction required of the regular medical officer.

The above personnel were then assigned to the various large cantonments to carry into effect the methods of psychological examining. From three to five commissioned officers and four to eight enlisted men were assigned to each of the larger training camps. In addition, from twenty to sixty privates were assigned for temporary duty as scorers, clerks, typists, and orderlies, to assist in the conduct of the examinations and to make readily available the results to the various commanding officers.

With this organization and by means of the group method, it was possible to examine, in times of pressure, as many as three thousand recruits in a single day in a given cantonment.

Variety of Tests Employed

ALPHA.—This is a group test and is intended for literates who can read, write, and understand English with a fair degree of ease. The general practice was to segregate recruits as they entered the examining station on the basis of the grade in school last attended—fifth grade, as a rule, for the white and eighth grade for the colored troops. Those who fell below these grades were ordered to take the illiterate (BETA) examination. With proper facilities as many as five hundred recruits could be examined in approximately one hour. The procedure was entirely objective in that the examiner and the scorers were wholly unacquainted with the men examined. The scoring was done by means of stencils and in the absence of the men examined, which procedure eliminated personal bias and prejudice.

Differences in intelligence, or degrees of mental competency, as revealed by the scores made, were indicated by

seven letter ratings, each letter being the equivalent of certain numerical points. The letter grades, the numerical equivalents, and significance of each are as follows:

A *Very Superior Intelligence:* 135 to 212 points. Men who graded "A," when possessed of other necessary qualifications, were regarded as "high officer type." From three to five per cent of the drafts were "A" grade men.

B *Superior Intelligence:* 105 to 134 points. Men who graded "B" frequently possessed other sterling qualities which qualified them for the commissioned officer type. In actual practice an occasional "B" grade officer outranked in efficiency an "A" grade officer, but only when other necessary qualities were pronounced in the former and relatively lacking in the latter. The "B" grade indicates high type of noncommissioned material.

C+ *High Average Intelligence:* 75 to 104 points. This grade indicates good noncommissioned officer material, rarely material for the commissioned rank.

C *Average Intelligence:* 45 to 74 points. Good private type with fair noncommissioned material.

C– *Low Average Intelligence:* 25 to 44 points. Ordinary private material.

D *Inferior Intelligence:* 15 to 24 points. Men of this grade are slow, illiterate, and as a rule make only fair soldiers.

D– *Very Inferior Intelligence:* 0 to 14 points. This grade of intelligence represents the mentally unfit, the incompetent who are recommended for either development battalions, special service organizations, or for discharge.

BETA.—Like ALPHA this is a group test but is intended for illiterates and foreigners. Knowledge of English is not essential in taking this test since the instructions are given by the examiner by means of demonstrations. This set of tests parallels ALPHA in the method of scoring, the variety of grades of intelligence classification, and in the objective character of the results. A workable correlation exists between ALPHA and BETA so that an "A" grade in the former is roughly equivalent to an "A" grade in the latter.

INDIVIDUAL TESTS.—Individual tests are given to those who fail or make a very low score in BETA after having failed in ALPHA. Two forms of individual examinations are used for those who understand English, namely, the Yerkes-Bridges Point Scale and the Stanford revision of the Binet Scale. By means of the Performance Scale illiterates in English are examined. The time required to give an individual examination varies from ten minutes to an hour.

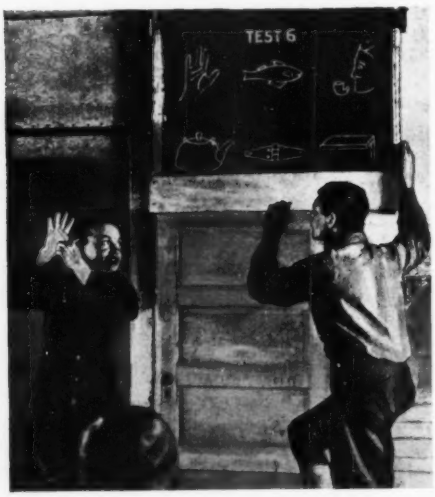
It is obvious from the above that the variety of tests covers every case and that, therefore, a complete mental classification of all recruits is made possible.

Major R. M. Yerkes, lately chief of the Division of Psychology, gives the following summary of the results of psychological examining in the various cantonments where this service was organized:

"The work of mental examining was organized finally in thirty-five army training camps. A grand total of 1,726,000 men had been given psychological examination prior to January 1, 1919. Of this number, about 41,000 were commissioned officers. More than 83,000 of the enlisted men included in the total had been given an individual examination in addition to the group examination for literates, for illiterates, or both.

"Between April 27 and November 30, 1918, 7749 (0.5 per cent) were reported for discharge by psychological examiners because of mental inferiority. The number of recommendations for assignment to labor battalions because of low grade intelligence was

9871 (0.6+ per cent). A total of 9432 men (0.6+ per cent) was recommended for assignment to development battalions in order that they might be carefully observed and given preliminary training to discover, if possible, ways of using them in the Army.



"Close-up" demonstration of BETA test.—The demonstrator is showing how to put in missing parts

Individual examination.—The manikin test, which the recruit is trying to put together, is one of the Performance tests given to those who have made a low score in the preceding group tests

"During this same period of six months, there were reported 4744 men with mental age ratings below seven years; 7762 between seven and eight years; 14,566 between eight and nine years; 18,581 between nine and ten years. This gives a total of 45,653 (3 per cent) men under ten years' mental age. It is extremely improbable that many of these individuals were worth what it cost the Government to maintain, equip, and train them for military service."

Sample Alpha Tests (for Literates)[1]

The recruits marched into the examining room, were seated, and each supplied with a pencil and examination booklet by orderlies who supervised the group during the examination and upon its completion collected the papers and pencils. As soon as the group was seated and supplied with the necessary examining material, the following general directions were given by the examiner:

"Attention! The purpose of this examination is to see how well you can remember, think, and carry out what you are told to do. The aim is to find out what you are best fitted to do in the Army.

"Now, in the Army a man often has to listen to commands and then carry them out exactly. I am going to give *you* some commands to see how well you can carry them out. Listen closely. Ask no questions. Do not watch any other man to see what *he* does.

[1] The ALPHA examination comprises eight tests given to recruits in groups numbering 500 as a desirable maximum. In practice the actual number probably did not exceed 200 as an average. Each such group could ordinarily be examined in somewhat less than one hour.

"Look at your papers. When I call 'Attention,' stop instantly whatever you are doing and hold your pencil up —so. (Examiner illustrates by raising his pencil.) *Don't put your pencil down to the paper* until I say 'Go.' Listen carefully to what I say. Do just what you are told to do. Remember, wait for the word 'Go.'"

Of the eight tests included in the ALPHA examination a limited amount of each of tests 1, 3, 4, 6, and 7 is given here.

PARTS OF TEST 1

Twelve items are included under this test of which 1, 4, 7, 11, and 12 are here reproduced (see below). Under each item are given the directions used by all psychological examiners in giving the test to recruits.

TEST 3

This is a test of common sense. Below are sixteen questions. Three answers are given to each question. You are to look at the answers carefully; then make a cross in the square before the best answer to each question, as in the sample:

SAMPLE — Why do we use stoves? Because
- ☐ they look well
- ☒ they keep us warm
- ☐ they are black

Here the second answer is the best one and is marked with a cross. Begin with No. 1 and keep on until time is called.

1 It is wise to put some money aside and not spend it all, so that you may
- ☐ prepare for old age or sickness
- ☐ collect all the different kinds of money
- ☐ gamble when you wish

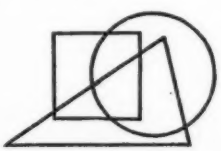
2 Shoes are made of leather, because
- ☐ it is tanned
- ☐ it is tough, pliable and warm
- ☐ it can be blackened

3 Why do soldiers wear wrist watches rather than pocket watches? Because
- ☐ they keep better time
- ☐ they are harder to break
- ☐ they are handier

---

1. ○ ○ ○ ○ ○

"Attention! 'Attention' always means 'Pencils up.' Look at the circles at 1. When I say 'Go' but not before, make a figure 2 in the second circle and also a cross in the third circle.—Go!" (Allow not more than 5 seconds)

4. 

"Attention! Look at 4. When I say 'Go' make a figure 2 in the space which is in the circle but not in the triangle or square, and also make a figure 3 in the space which is in the triangle and circle, but not in the square.—Go!" (Allow not more than 10 seconds)

7. A B C D E F G H I J K L M N O P

"Attention! Look at 7. When I say 'Go' *cross out* the letter just after F and also draw a line *under* the second letter after I.—Go!" (Allow not more than 10 seconds)

11.

"Attention! Look at 11. When I say 'Go' draw a line through every odd number that is not in a square, and also through every odd number that is in a square with a letter.—Go!" (Allow not more than 25 seconds)

12. 1 2 3 4 5 6 7 8 9

"Attention! Look at 12. If 4 is more than 2, then (when I say 'Go') cross out the number 3 unless 3 is more than 5, in which case draw a line *under* the number 4.—Go!" (Allow not more than 10 seconds)

9 If a man who can't swim should fall into a river, he should
- ☐ yell for help and try to scramble out
- ☐ dive to the bottom and crawl out
- ☐ lie on his back and float

After one and a half minutes the examiner called "Stop" and directed attention to test 4.

TEST 4

If the two words of a pair mean the same or nearly the same, draw a line under *same*. If they mean the opposite or nearly the opposite, draw a line under *opposite*. If you cannot be sure, guess. The two samples are already marked as they should be

SAMPLES
good—bad .....same—opposite
little—small .....same—opposite

no—yes .....same—opposite
day—night .....same—opposite
go—leave .....same—opposite
begin—commence .....same—opposite
bitter—sweet .....same—opposite
credit—debit .....same—opposite
assiduous—diligent .....same—opposite
transient—permanent .....same—opposite
palliate—mitigate .....same—opposite
execrate—revile .....same—opposite

Forty pairs of words compose this test and one and a half minutes are devoted to it.

TEST 6

SAMPLES	2	4	6	8	10	12	*14*	*16*
	9	8	7	6	5	4	*3*	*2*
	2	2	3	3	4	4	*5*	*5*
	1	7	2	7	3	7	*4*	*7*

Look at each row of numbers below, and on the two dotted lines write the two numbers that should come next.

3	4	5	6	7	8	...	...
8	7	6	5	4	3	...	...
10	15	20	25	30	35	...	...
81	27	9	3	1	⅓	...	...
1	4	9	16	25	36	...	...
16	17	15	18	14	19	...	...
3	6	8	16	18	36	...	...

Twenty completion number series comprise the test and three minutes are devoted to it.

TEST 7

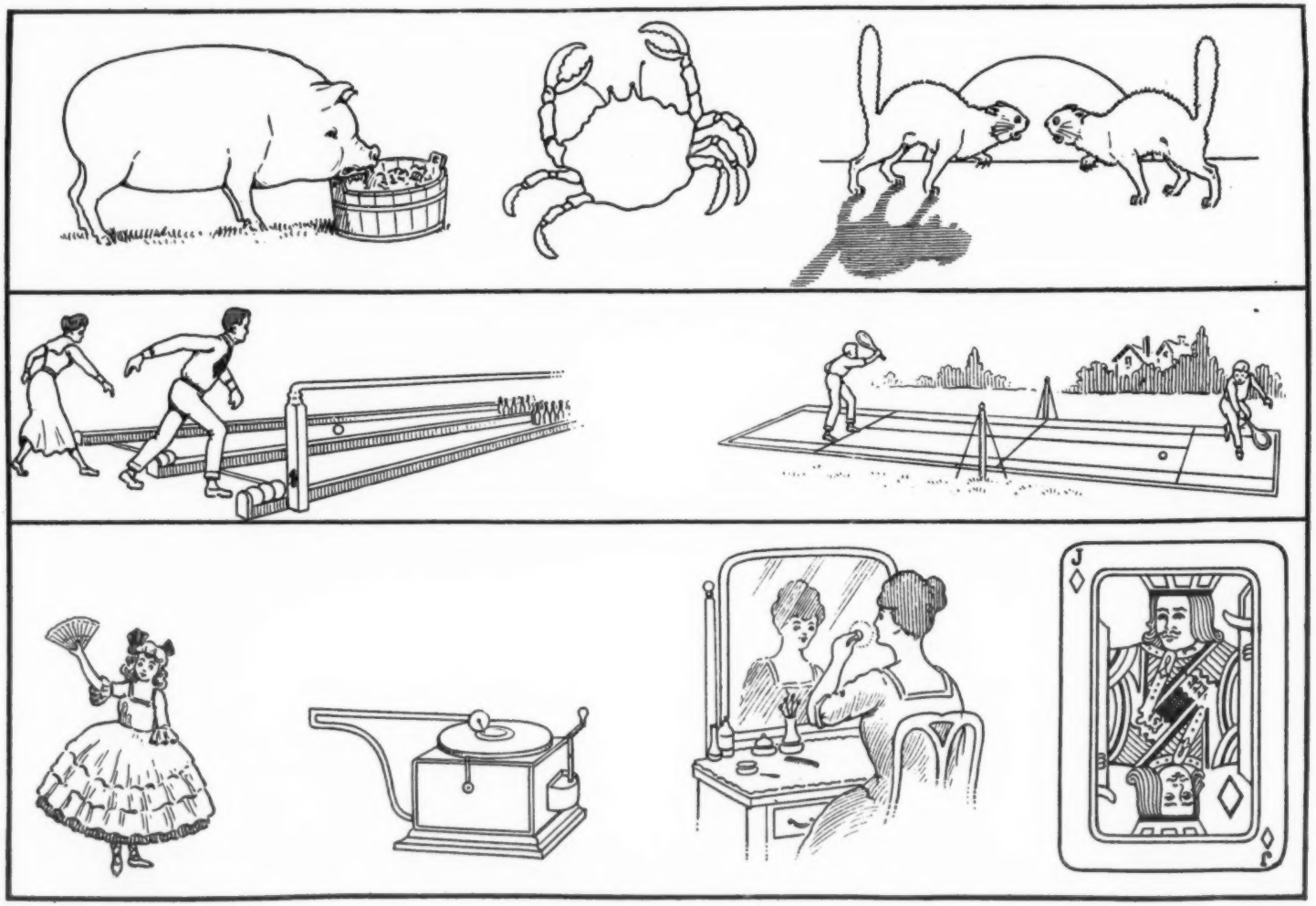
SAMPLES
sky—blue :: grass—
table green warm big
fish—swims :: man—
paper time walks girl
day—night:: white—
red black clear pure

In each of the lines below, the first two words are related to each other in some way. What you are to do in each line is to see what the relation is between the first two words, and underline the word in heavy type that is related in the same way to the third word. Begin with No. 1 and mark as many sets as you can before time is called.

shoe—foot :: hat—
kitten head knife penny
pup—dog :: lamb—
red door sheep book
spring—summer :: autumn—
winter warm harvest rise
devil—angel :: bad—
mean disobedient defamed good
finger—hand :: toe—
body foot skin nail
Caucasian—English :: Mongolian
Chinese Indian negro yellow
Indiana—United States :: part—
hair China Ohio whole
esteem—despise :: friends—
Quakers enemies lovers men
abide—stay :: depart—
come hence leave late
abundant—scarce :: cheap—
buy costly bargain nasty

Forty relational or proportional sentences make up this test. The time limit is three minutes.

The general character and procedure of the literate (ALPHA) examination are indicated by the above tests from which certain parts of each have been deleted. The total results of the Army tests give a reliable index or measure of native ability as contrasted with the conventional measurements of acquired learning. Of paramount importance are the discovery and selection of men of very superior mental alertness, of ability to think accurately and quickly, and to analyze situations, comprehend clearly, and act decisively.



PICTURE COMPLETION TEST

In this BETA test a certain part or parts are lacking in each figure and are to be supplied in a manner analogous to the demonstration which preceded. Twenty different incomplete figures comprise the test. A time limit of 3 minutes is set on the test

Sample Beta Tests (for Illiterates and Foreigners)

In the so-called BETA tests a knowledge of the English language is not necessary. It is, therefore, possible to discover foreigners and others of high grade native ability as well as other grades of mental ability.

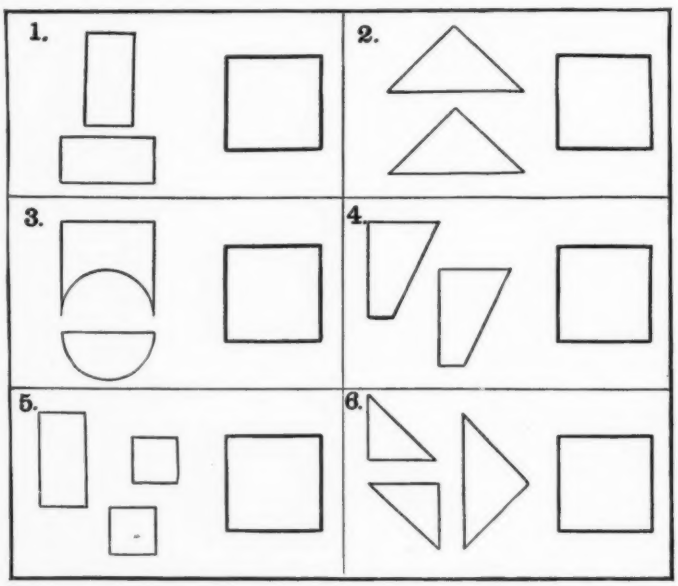
As in the case of ALPHA, the BETA examination comprises eight distinct tests. Each test is demonstrated on a blackboard, partly in pantomime, by the examiner with the assistance of an orderly. Parts of two of the eight tests are given here.

Value of the Psychological Service

If it costs $2500, as has been estimated, to equip, train a man for eight months, and send him overseas; if he is now found mentally incompetent and therefore returned, mustered out, insurance and pension obligation closed at an additional expense of $2500, then we find a total of $5000 needless expenditure.

It becomes a plain matter of arithmetic to compute the wastage in selecting, for example, 10,000 of such mental incompetents. Compare this enormous wastage with the cost of giving mental tests to one hundred times this many men at twenty-five cents per man. As a matter of fact, during six months of psychological examining there were 12,506 men reported with intellectual maturity ranging from less than seven years to under eight. It requires no particular levy on the imagination to determine the degree of responsibility attached to this grade of intelligence.

Add to this number 33,147 men with a mental rating of between eight and ten years and the economic importance of mental classification of recruits becomes apparent. When we consider the clogging effects of very low grade mentals in the development of army organization and the positive dangers connected with the assignment of these children with adult bodies to combatant units, the value of mental classification becomes increasingly manifest. Professional and emergency army officers were not slow in recognizing the importance of this type of service.



Geometrical construction in BETA test.—Through use of cardboards, blackboard, pantomime, and demonstration, the subjects are directed to fit in the separate pieces by means of pencil lines in the heavy-faced square figure to the right in each of the ten problems. At the end of 2½ minutes the examiner calls "Stop!" and the next test is undertaken

The words of Major Robert Conard, M.R.C., Surgeon, 367th Infantry, A.E.F., are significant in this connection:

"The sorting process, both physically and *mentally,* is, as it seems to me, one of the most important things to

be done. I eliminated about a thousand and am now reaping the benefit in the way of a phenomenally low ineffective rate, which I hope to maintain. *The mental selection is a great thing, and cannot be given too much weight.* So much time and energy have been wasted in training men who are mentally unfit, that I am sure the value of early elimination of that element must be recognized."

Purposes of Intelligence Tests

Among the main purposes of the psychological service may be listed:

(1) Segregation of the mentally deficient from those capable of doing combatant service;

(2) Further segregation of those wholly incompetent for military service from those capable of service in labor battalions;

(3) Assistance in the selection of candidates for (*a*) Infantry School of Officers, (*b*) Quartermaster Schools, (*c*) Machine-gun Schools, (*d*) Artillery Schools, (*e*) Signal Schools, and (*f*) Noncommissioned Officers' Schools;

(4) Assistance in determining fitness for promotion or assignment to positions of responsibility;

(5) Assistance for personnel adjutants in the assignments of recruits to organizations in such a way as to secure an equitable distribution of intelligence and thus avoid loading one company of a regiment, for example, with a preponderance of relatively inferior men while overweighting another with relatively superior men;

(6) Assistance in classifying men sent to battalion schools into classes of approximate ability, thus enabling each group to proceed at a rate commensurate with the ability of the group.

General Significance of the Psychological Service

The fundamental idea back of the psychological service as a whole consists essentially in the clear recognition of the elemental fact that supremacy must ultimately, if not immediately, rest with that side of a contentious world which levies insistent tribute upon its intelligent manhood. It is a generally acknowledged principle that success hangs heaviest on intelligent leadership and that places of responsibility cannot be safely entrusted to any save those endowed with nothing short of very superior or superior ability, the gifted members of society.

In recognition of this cardinal principle, in view of the extraordinary value of native resourcefulness, and, in view of the imperative necessity of utilizing the best brains of the nation in positions of leadership, the psychologists, under the able direction of Major R. M. Yerkes, conceived the idea of applying the science of psychology to the difficult task of classifying the men of the American Army into seven grades of intelligence. The top grade representing the cream of American manhood was thereby immediately made available to the regular army officer, who, let it be said to the lasting credit of a somewhat maligned professional class, was not slow to employ intelligence tests, upon being convinced of their validity and utility, in the selection of commissioned and noncommissioned officers. It is true that "cream will rise to the surface"; it is equally true that the process is slow and wasteful. The psychological "separator" not only abbreviated the process but graded the quality.

The outstanding significance of the psychological service, its most enduring contribution to national well-being consists in demonstrating the imperative necessity of placing intelligence examination on a parity with physical examination as now conducted by the medical profession. In this respect the work of the psychologists in the American Army finds no parallel or precedent.

The Intelligence of Negro Recruits

By M. R. TRABUE

Director, Bureau of Educational Service, Columbia University

ONE of the most interesting results found by the psychologists who examined recruits entering the United States Army, during the war just closed, was the surprisingly low intellectual level of those members of the colored race who were examined. Previous studies had been confined very largely to comparisons of the Negroes in public schools with white children in the same schools. These had invariably resulted in lower averages for the colored race than for the white, but in almost every case the differences had been relatively small and the ranges of abilities for the two races had been practically identical.

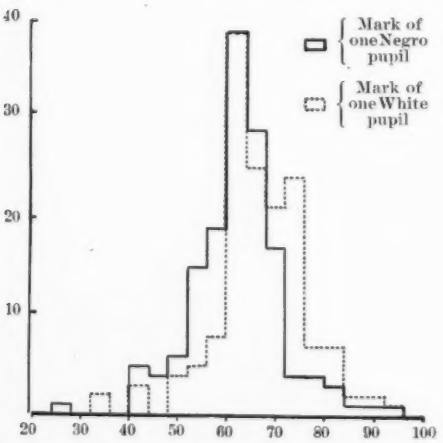
As an example of the studies which had been made, the following summary may be given of the findings of a study of the school records of one hundred and fifty Negroes entering the high schools of New York City.*

1. Only 36 per cent of the Negroes are as young at the time they enter high school as the median white child entering the same high school, the average difference between the ages of the two races being seven months.

2. The Negroes who enter high school in New York City remain somewhat longer on the average than the white pupils.

3. The scholarship marks assigned by teachers to the colored pupils in the New York City high schools average somewhat lower than the marks assigned by these same teachers to the white children. The accompanying figure shows the range of the final marks for sixty-six white pupils and for sixty-two colored pupils. It will be seen in this distribution that not more than .7 of the distribution of marks for colored pupils is below the average of the white pupils.

4. English is the one study in which there is the greatest difference between colored and white pupils. Only one fourth of the colored pupils attain marks in English which are as good or better than the average mark obtained by white pupils in the same study.



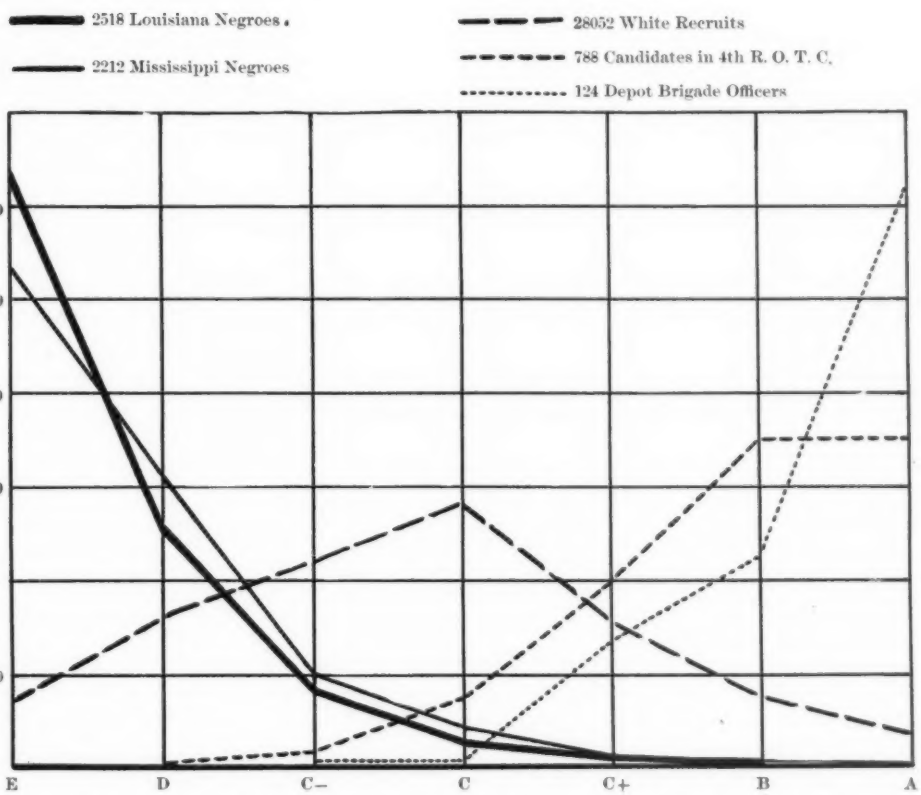
Comparison of the distribution of scholarship averages (the figures from 20 to 100, below) of white and colored pupils in New York City high schools.—The scholarship marks for an individual are the median of all marks obtained by the pupil, except those obtained in courses repeated because of failure. The figures at the left indicate the number of pupils in the respective columns who gained the average indicated below the columns

Studies by Dr. George O. Ferguson[1] had also indicated that Negroes were distinctly less capable in educational measurements than the white children in the same school systems in the South. Dr. Ferguson also found that when he classified his colored pupils into groups according to the blackness of their skins, the relationship between color and achievement was quite distinct, those with lighter skins making higher scores.

The writer was very much surprised in July, 1918, at the differences in the intelligence scores obtained between certain groups of Negroes drafted for the Army and sent to Camp Grant, Illinois, and the white men who were drafted to the same camp. The diagram opposite represents the percentages of the various "intelligence grades"

* Mayo, M. J. Mental Capacity of the American Negro, *Archives of Psychology*, Vol. XXVIII, 1913.

[1] Psychology of the Negro, *Archives of Psychology*, Vol. XXXVI. Dr. Ferguson has reported findings with the Army tests, similar to those reported in this article, in The Intelligence of Negroes at Camp Lee, Virginia, *School and Society*, Vol. IX, No. 233, June 14.



The figures at the left represent the percentages of the various groups of Army recruits examined which passed with a given rating, while the letters "A" to "E" at the bottom represent the ratings, or the degrees of excellence in the tests. The table shows that 28 per cent of the white recruits examined at this time received a rating of "C," whereas only 2½ per cent of the Louisiana Negroes made this grade; that more than 60 per cent of the Louisiana Negroes fell into the "E" or lowest class, and more than 60 per cent of the depot brigade officers received a rating of "A" or highest class

assigned to 2518 Negroes from Louisiana, to 2212 Negroes from Mississippi, to 28,052 white men from Illinois, Wisconsin, and Minnesota, to 788 candidates for commissions in the Fourth Reserve Officers' Training Camp, and to 124 officers of the 161st Depot Brigade, all examined during the months of June and July, 1918. Grade A was intended to indicate very superior intellectual capacity; grade B, superior ability; grade C+, high average ability; grade C, average; C–, low average; D, inferior; and E, very inferior.

These comparisons were rather surprising when one considered the results which had previously been found,—especially startling is the unusually large difference shown here between the distributions for Negroes and the distributions for white men. The grade of "superior" or "very superior" was obtained by only .2 of 1 per cent of the Negroes from Louisiana, and .5 of 1 per cent of the Negroes from Mississippi, while 10.7 per cent of the white men have this high standing. At the other extreme, it will be seen that only 7.4 per cent of the white men have a grade of "inferior" or "very inferior," while 52.9 per cent of the Mississippi Negroes and 63.3 per cent of the Louisiana Negroes have this low grade.

The results of the intelligence examinations in the Army are more reliable

in many respects than the data used in previous studies. In the first place, previous studies had dealt entirely with school pupils; that of Mayo, particularly, had dealt only with Negroes and white pupils who had persisted in school work up to the high school grades. A very much smaller and more highly selected proportion of the colored race than of the white race persists in its efforts to secure an education; hence, previous comparison had been between the "cream" of the colored race and more or less ordinary white persons. The Army results are for relatively unselected samples of both races.

The comparison in the Army may be somewhat favorable to the colored race because of the greater possibility of intelligent white men obtaining commissions or entering some essential industry, which would exempt them from being drafted. Practically, however, this removal of many of the more clever white men from the drafted group is not important and is probably compensated for by the fact that less care was taken by draft boards in eliminating unfit Negroes than was the case with white recruits.

Mayo, in his study in New York City, had used teachers' marks as the basis for comparisons, while in the Army actual performances on the same sets of tasks and problems were used as the basis. In other words, as a basis for comparisons between the two races, the objective, definite nature of the Army tests is very superior to the estimates given by teachers in assigning scholarship grades.

During the latter part of July, 1918, a large draft of Negroes from St. Louis, Chicago, and the surrounding territory was sent to Camp Grant. In the meantime, additional Negroes from the South had been examined. Comparisons were made early in August between the scores of these northern Negroes and their southern brethren, on the one hand, and the white men among whom they were now living, on the other.

To be perfectly fair to both races and to eliminate so far as possible the probability that white men were given an undue advantage by the better educational opportunities of the North, the scores for literate and illiterate men were kept separately. Test Alpha required that the person taking it be able to understand oral and printed directions and statements in the English language and to carry out these directions thoughtfully. Test Beta did not require ability to understand either printed or spoken English. The directions were given by demonstration and pantomime, and the tasks to be done were such that ability to read or recognize the words and letters of the English language was not required. The comparisons in Table I are, therefore, for white men and Negroes who had been educated in the English language and were accustomed to reading and writing frequently. The comparisons in Table II are for men of both races who had not learned to read or write sufficiently well to make practical use of their accomplishments. The same facts are shown graphically in the figures on page 684.

Later examinations of similar groups revealed exactly the same type of thing, and correspondence with the psychological examiners at other camps indicated that our findings at Camp Grant were typical of the results obtained in other parts of the country.

There are one or two very important features which probably need to be recognized as cautions in interpreting the scores represented above. It is probable that even though the white men in Table II were just as illiterate as the colored men in that table, the white men had had, nevertheless, somewhat more experience in making check marks with a pencil than had the colored men. It may also be that a few of the pic-

TABLE I

FREQUENCY OF SCORES MADE BY LITERATE RECRUITS, CAMP GRANT, ILLINOIS

Raw Alpha Scores	*White Recruits*	*Northern Negroes*	*Southern Negroes*
210–212	....	....	....
200–209	2	....	....
190–199	12	....	....
180–189	39	1	....
170–179	106	3	1
160–169	194	6	....
150–159	325	5	....
140–149	437	8	2
130–139	583	13	1
120–129	740	23	4
110–119	1013	38	5
100–109	1311	42	5
90–99	1578	63	12
80–89	1915	79	19
70–79	2155	126	22
60–69	2506	164	22
50–59	2864	194	41
40–49	2850	231	79
30–39	2928	251	119
20–29	2451	260	179
15–19	999	161	129
10–14	810	139	217
5–9	555	106	284
1–4	213	55	184
0	19	2	11
No. of Alpha Tests	26605	1970	1336
Percentage of Total No. Examined .	76.1%	55.9%	28.3%
Median Score	57.9	40.5	14.4

TABLE II

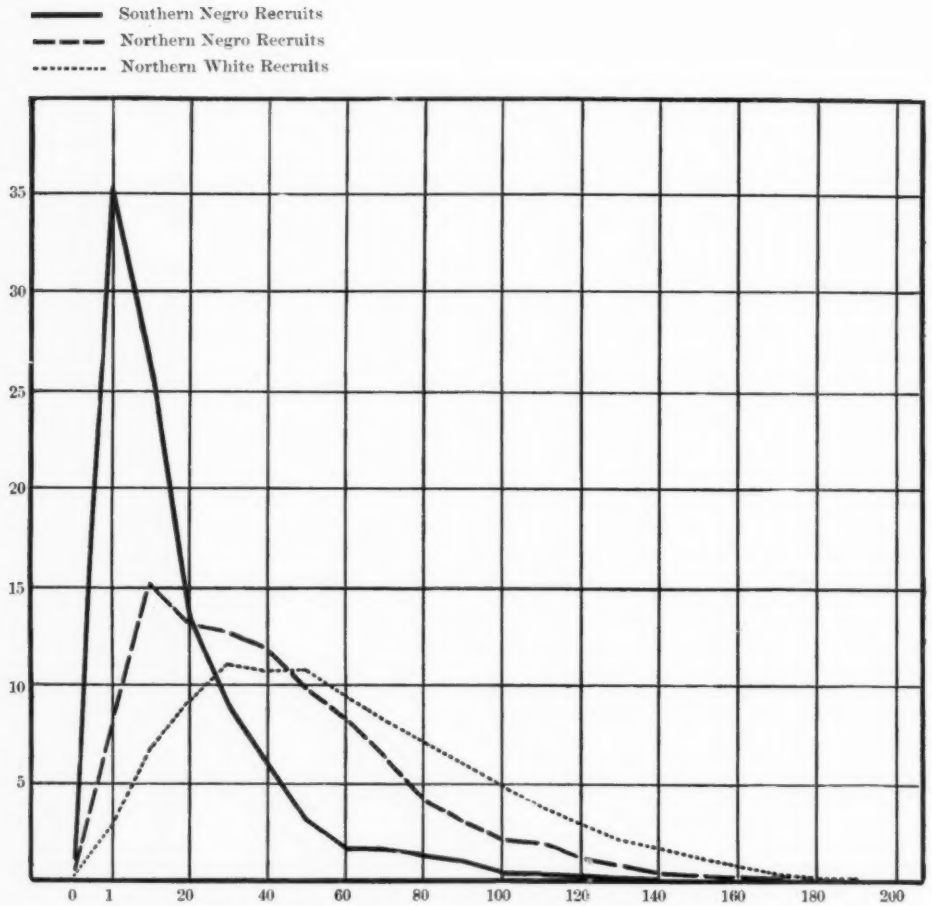
FREQUENCY OF SCORES MADE BY ILLITERATE RECRUITS, CAMP GRANT, ILLINOIS

Weighted Beta Scores	*White Recruits*	*Northern Negroes*	*Southern Negroes*
210–219	....	....	....
200–209	13	....	....
190–199	27	....	1
180–189	73	....	3
170–179	153	1	1
160–169	269	2	2
150–159	384	8	2
140–149	541	15	9
130–139	630	34	13
120–129	691	46	19
110–119	775	77	30
100–109	694	87	52
90–99	697	88	77
80–89	618	141	90
70–79	566	133	147
60–69	578	180	197
50–59	514	188	273
40–49	380	177	402
30–39	356	157	525
20–29	240	115	569
10–19	126	75	553
1–9	57	32	335
0	5	....	82
No. of Beta Tests	8387	1556	3382
Percentage of Total No. Examined .	23.9%	44.1%	71.7%
Median Score	100.8	61.9	32.9

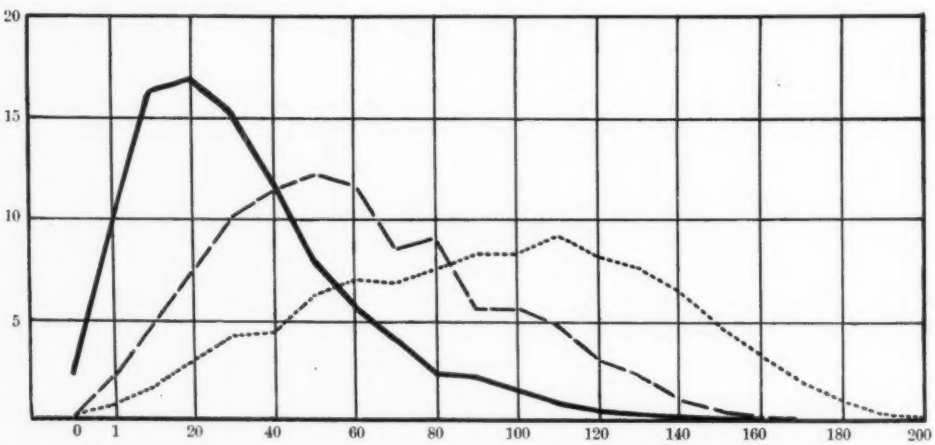
tures presented for checking were not so familiar to the colored men as they were to the white men in the North. For example, a house without a chimney would possibly not be recognized as quickly by a Southerner as by a person in the North. It is also quite possible that northern white men, even though illiterate, are accustomed to seeing papers with pictures and diagrams much more frequently than the colored men of the South. Nevertheless, it is quite evident from the above tabulations, and still more so from the performances of the two races with blocks, guns, beds, tent rolls, squad formations, and the like, that the white race is tremendously more capable in matters requiring ability to learn and to think than is the black race.

It is also quite clear that those Negroes who live in the North are a highly selected group. It seems probable that the Negro may not have the ambition to leave his southern environment unless he has somewhat more intelligence and ability than his fellows, and that, after arriving in the North, he is not able to compete with the white laborer and to make a living for himself and his family, unless he has a degree of intelligence which is fairly comparable with that of the whites among whom he is living.

Just how this fresh and more exact information, which was the result of



Literate Negroes and Whites compared: scores in test Alpha (first trial).—These curves show the percentages (indicated by the numbers at the left) of certain groups of recruits which received in intelligence test Alpha the scores indicated on the bottom line. This test was designed for men who could read and write English. (See page 683)



Illiterate Negroes and Whites compared: scores in test Beta (first trial).—Curves similar to the above but for test Beta designed for illiterates, show that about 9 per cent of white recruits made a grade of 110, while only 5 per cent of northern and 1 per cent of southern Negroes received this rating. (See page 683)

mental testing in the Army, is going to affect the social problem of adjusting the two races, is not clear. The information presented above will be included with that obtained in many other camps when the Division of Psychology of the Office of the Surgeon General of the Army publishes its official report. The facts will be tremendously interesting and worth while as an indication of what the situation really is, but they will not, of course, in themselves indicate just what should be done about it. Each student of sociology will interpret them in his own way. The writer, being a member of the educational profession, has the following suggestions to make regarding the education of the Negro.

It would seem utter folly to try to transplant the system of schools which now exists for white people, and which has been developed for many generations with the learned professions as its ultimate goal, to the Negro race. The average northern Negro has ability to learn new things which is about equivalent to that possessed by the average eleven-year-old white school boy, while the average southern Negro is about as capable in his intellectual capacities as the average nine-year-old white school boy. Of course, there are a few Negroes of "superior" and "very superior" intelligence, but with our modern facilities for testing the intelligence of children and adults, this small percentage of the colored race might easily be selected out of the mass of their fellows and given opportunity to study the learned professions, if they so desire, without condemning the millions of ordinary Negroes to a system of education in which they are absolutely certain to fail of success.

It is just as respectable and necessary in this world of ours to till the land, to care for animals, clothing, lawns, shrubbery, and personal comfort, to serve the public as waiters, porters, scavengers, and the like, as it is to preach the gospel, explain the law, or teach mathematics. Inventive minds are cramped and become ineffective if they have to be turned constantly toward things other than the fields in which they are interested, just as dull minds are made discontented and dangerous if required or encouraged to undertake work in which they are certain to fail. We must all serve one another according to our particular capacities. The proper social ideal and educational program would provide for those Negroes and whites who will never be able to learn to read and write, effective training in some field in which they can be successful and happy. At present, about the only thing we offer is an academic education, leading nowhere in particular and impossible of mastery by more than a very small percentage of the colored race.

Such training as is suggested above should be a fundamental part of the public school system in localities where the intelligence of the citizens, white or black, is such as to demand that type of education. These courses should not be considered "inferior" or less "respectable" than the present public school curriculum. It is no disgrace for a child who is blind to have to attend a course which is prepared especially for those with his limited abilities, and it should not be any less respectable for a "dull" child, white or black, to attend that section of the public school system which is best fitted to train him in fields where he can take training and in which he will be content and successful. Contentment adds to efficiency and success leads to contentment. Our present school program is not fitted for the large mass of the Negro race, and for a considerable portion of our white race. Fundamental changes need to be made for the sake of those whose ability runs along the lines of personal service and bodily toil rather than to the juggling of words and ideas.

Central African Pygmy *South African Bushman* *Andamanese Negrito*

SKULLS OF THE THREE TYPES OF NEGROID PYGMIES

These skulls may be taken as fairly typical of the three groups which they represent. They are all small and rather infantile in general appearance. In the top view the skulls present a rhomboidal contour, with prominent parietal eminences and a narrow frontal region. The brain cases overhang the face and cheek bones so that these are not visible in this view. The proportion of the breadth to length of brain case is greater than it is in most Negro skulls. In the front view the low, broad, nasal openings are conspicuous. In the Andamanese skull the nasal opening is somewhat higher and narrower than in the other two. The African Pygmy and Andamanese skulls have very high orbits and the width and height are nearly equal. In the Bushman skull the orbits are slightly lower. The faces are very small in comparison with the size of the brain case. In profile the skulls show more individuality. The face of the African Pygmy is projecting or prognathous. In this it agrees with the skulls of Negroes in general. In the Andamanese skull the projection of the face is not so marked, while the Bushman face is nearly vertical. All three of the skulls have vertical foreheads but the Bushman shows an extreme development of this characteristic. The occipital regions are projecting and the mastoid processes are small in all three skulls

The Pygmy Races of Man

By LOUIS R. SULLIVAN

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PROBABLY no other groups of mankind have inspired so many theories and so much speculation as have the Pygmy races of man. From the very earliest times up to the present, travelers, geographers, philosophers, anthropologists, and others including myself have written of them at the slightest provocation. In spite of this fact a survey of the literature impresses one with the sparsity of concrete facts upon which all the theories and speculations are based.[1]

Before detailing their geographical distribution, let us come to an understanding as to just what we mean by Pygmy. A hard and fast rule has been set by some anthropologists which admits to the classification as Pygmies, any group of mankind whose average stature does not exceed 150 centimeters or 4 feet, 11 inches, in the male sex. As we shall see later, such a definition has certain advantages, inasmuch as 150 centimeters is the starting point for a normal frequency curve of the stature of the bulk of mankind. But a too strict adherence to the rule will exclude some true Pygmy groups. At the same time it will include only a very few groups.

Many racial groups who have for years been considered and described as Pygmies and who are undoubtedly related to other tribes considered as Pygmies cannot qualify at 150 centimeters. One reason for this is that enthusiastic travelers, disregarding accurate measurements, have almost invariably underestimated the average stature of various groups by from two to four inches, as later measurements have proved.

An observer, be he ever so careful, is usually impressed by the extremes in a group and will accordingly underestimate the average stature of a tribe containing many short individuals and overestimate that of a tribe containing many tall individuals. Still others have no use for averages and will designate certain tribes as being composed of both Pygmies and tall individuals. Such tribes undoubtedly exist but are rare and one type or the other predominates by a large majority.

Normally there should be a few individuals of average stature in the shortest group of Pygmies. Likewise there should be individuals of very short stature in a group having a high average stature. To make the matter clear, let us examine the distribution of stature in a few groups having different averages.

Our comparison will be less confusing if our groups contain the same number of individuals. Since this is impossible, we can obtain nearly the same result by reducing the series to a percentage basis and assuming that each group contains 100 individuals. For the sake of variety, let us choose 100 Andamanese Negritos, 100 Kung Bushmen, 100 Italians from Sicily, and 100 Scotchmen. In the figure on page 688 I have placed in column I the range of stature in mankind in 2-centimeter intervals. The shortest stature, 136 centimeters, I have placed at the bottom of the column, and the tallest, 186 centimeters, at the top. Individuals with a stature from 136 to 159.9 centimeters, we shall call short, from 160 to 169.9 centimeters, medium, and from 170 to 186 centimeters, tall. Opposite this scale we shall distribute the men according to their stature.

Each short vertical line represents one man and is placed opposite the figure in the scale which represents his stature. In column II I have placed the Andamanese, in column III the Bushmen, in column IV the Italians, and in column V the Scotchmen. A cross indicates the approximate average of each group. It will be noted that the rows near the average contain the larger number of individuals.

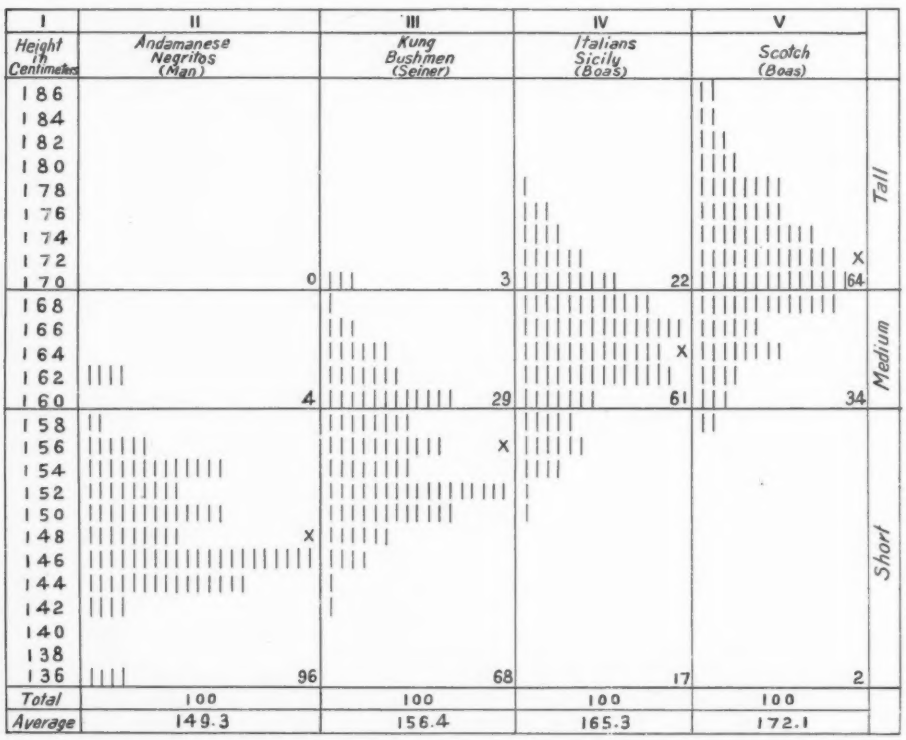
As we proceed in either direction from

[1] Eliminating the mere verbal descriptions of travelers and the more accurate descriptions of very small groups of individuals, the bulk of the data on the living Pygmies has been contributed by Man, Montano, Martin, Skeat, Annandale, Sarasin brothers, Barrows, Reed, Wollaston, Williamson, Neuhauss, Schlaginhaufen, Van den Broek, Poutrin, Czekanowski, Seiner, Werner, and Johnston. The most important studies on the skulls and skeletons have been made by Flower, Turner, Duckworth, Martin, Sarasin brothers, Shrubsall, Koeze, Van den Broek, Poutrin, and Schlaginhaufen. I shall not attempt to add to the existing theories, but shall merely note the main points of interest presented by the Pygmies.

the average we find fewer and fewer individuals. The Andamanese have an average stature of 149.3 centimeters. Ninety-six of the 100 men are short and only 4 are of medium stature. The Bushmen are slightly taller on the average (156.4 centimeters). Three individuals are tall, 29 of medium stature, and 68 short. Most of us have been impressed by the short stature of the South Italians and will be surprised to note that there are relatively few very short individuals. The average stature is 165.3 centimeters. Twenty-two are tall, 61 medium, and 17 short. The Scotch present the other extreme. The average stature is 172.1 centimeters, 64 are tall, 34 medium, and only 2 are short.

From the above it will be seen that dwarfism is a relative matter and that the transitions within the group and between two given groups are so gradual that it is very difficult to draw a hard and fast dividing line. The Pygmies merge gradually into mankind proper in the matter of stature. For this reason we shall be inclined to include as Pygmies some groups whose average stature exceeds 150 centimeters. We shall also mention certain other groups who, though perhaps not true Pygmies, are borderline cases.

In the main the word Pygmy is restricted to several Negroid racial types of small stature. Best known of these are the Central African Negrillos and the Oceanic Negritos. The exact distribution of the Central African Negrillos cannot yet be stated with finality. Roughly, they are mostly confined to a belt five degrees north and south of the equator extending nearly across the African continent. The greater number of the tribes inhabit the dense for-



Distribution of stature in four groups having a different average stature.—Each short vertical line represents one man and is placed opposite the number on the scale (column I) representing his stature. In column II are 100 Andamanese Negritos whose average stature is 149.3 centimeters. Ninety-six of these are short, 4 are medium, and none is tall. Of the 100 Bushmen in column III, 68 are short, 29 are medium, and 3 are tall. In column IV, 100 Italians from Sicily have an average stature of 165.3 centimeters, 17 are short, 61 are medium, and 22 are tall. The Scotch in column V present the other extreme. The average stature is 172.1 centimeters and 64 are to be regarded as tall, while 34 are medium, and only 2 are short

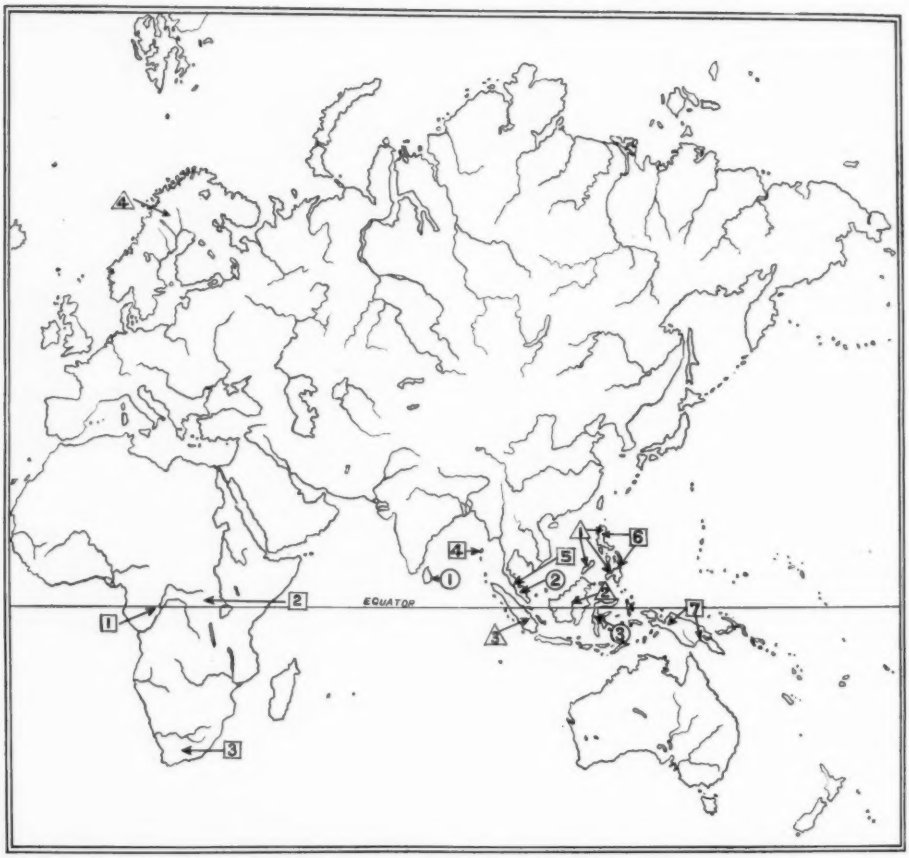
ests. The distribution of the Oceanic Negritos is more definitely known. The "Mincopies," so called, inhabit the Andaman Islands. They are of particular interest because of their long isolation on these islands. Another group of Negritos known as the Semang are found in the interior of the Malay Peninsula. Still a third group known as the Aeta are found sporadically in the Philippine Archipelago. More specifically they are found in the Apayao swamp region, in the Ilocos Mountains, in the Zambales Mountains, in the East Luzon Mountains, in the South Luzon Mountains, in the island of Palawan, and in Mindanao. Very recently Pygmy Negroid tribes have been discovered in the interior of British and Dutch New Guinea. Finally, the South African Bushmen constitute a third group. They occur sporadically in South Africa, particularly in the region of the Kalahari Desert.

But the Negro race is not unique in the production of Pygmy types. The Mongoloid race includes many groups of very short stature and the Australoid race contains true Pygmies. The Veddah of the island of Ceylon, south of India, the Sakai and Senoi of the Malay Peninsula, and the Toala of Celebes Island are all very short. They belong to the Australoid or pre-Dravidian race. The Indonesians of Mongoloid affinities, while perhaps not true Pygmies, are of very short stature. As representatives of this type we may mention the Bontok, Nabaloi, Kankanay, and Ifugao of the Philippines, the Murut, Kalabit, Kayan, Maloh, etc., of the interior of the island of Borneo, the Tenggerese of Java, the Batak[1] and Kubu of Sumatra, and possibly some of the mixed tribes of the Malay Peninsula. The Lapps of Norway, Sweden, and Russia form still another group of Mongoloid affinities, but quite different from the Indonesians. The distribution of these groups is indicated approximately on the outline map of page 690. This list includes all of the dwarfed types of living man.

It is necessary to mention, however, that prehistoric dwarfs or Pygmies are reported from Peru, South America, and the Neolithic strata of Switzerland. In both instances the reports are based on a very few specimens. Best known are three skeletons from Schweizerbild, Switzerland. All three are females and it is estimated that they belonged to individuals 140.8, 145.5, and 151.2 centimeters in height. The male stature corresponding to these would be approximately 151.0, 156.1, and 162.2 centimeters, respectively. From the same place we have a male skeleton belonging to an individual approximately 165.6 centimeters tall. Schwerz gives as the average stature of 11 female skeletons from the Neolithic of Switzerland, 149.7 centimeters, and of 7 males, 161.6 centimeters. It would seem from this that the Neolithic Swiss are not to be classed with the Negroid or Australoid Pygmies in the matter of stature and we shall not consider them further.

There are two points of particular interest in the distribution of the Pygmies. The first is their discontinuous distribution, occurring as they do only sporadically over widely separated areas. The second is the fact that wherever they are found today they are occupying the least desirable portions of the country. In the Philippines they are confined principally to the mountains and swamps; in Central Africa they are found in the forests; in South Africa they inhabit the desert regions; and elsewhere in the Malay Peninsula and New Guinea they are inland and mountain-dwelling people. Everywhere they are outnumbered and surrounded by other groups who occupy the more desirable portions of the locality. This fact has given rise to two theories. The first is to the effect that life in an unfavorable environment has been the cause of their short stature. When all things are taken into consideration it would seem that the short stature is the horse and the unfavorable environment the cart and that the Pygmies live in undesirable places because of their short stature. The other theory is that this discontinuous distribution of the Pygmies and the fact that they are always surrounded by one or more racial types are indicative of their early arrival in the regions where they now occur. In fact there are many who advocate them as the most primitive of all the living races of men. To the anatomical side of this theory we shall return shortly, but it may be pointed out here that this apparent stratification which occurs might be of quite recent origin. The fact that they are outnum-

[1] The name Batak is used indiscriminately for Philippine Negritos and Sumatran Indonesians, although there is no linguistic or physical relationship between the two groups.



DISTRIBUTION OF THE PYGMY AND SHORT RACES OF MAN

NEGROID PYGMY TYPES

1. Central African Negrillos
2. Central African Negrillos
3. South African Bushmen
4. Andamanese Negritos
5. Semang Negritos
6. "Aeta" Philippine Negritos
7. Melanesian Pygmies

AUSTRALOID PYGMY TYPES

1. Veddah
2. Sakai, Senoi
3. Toala

SHORT MONGOLOID TYPES

1. Indonesians of the Philippines
2. Indonesians of Borneo
3. Indonesians of Sumatra
4. Lapps of Norway

bered by other races wherever they are found, would lead to a stratification even if the Pygmies were very recent arrivals in a given locality.

Let us now consider briefly the physical characteristics of the Pygmies and see how much they have in common and in what respects they differ from one another. The most striking characteristics shared by all the Pygmy groups are short stature, a rather broad nose, dark skin, and hair that is not straight.

In Table I is listed the average stature of the Pygmies and some near-Pygmy tribes. For convenience these are grouped geographically and racially. The shortest group of any considerable size so far recorded is the Mawambi Negrillos described

by Czekanowski. They are less than 4 feet 8 inches tall on the average. The Andamanese, Philippine Negritos, and a few New Guinea tribes are 150 centimeters or well below. The Semang are somewhat taller. Very few African groups have an average stature of less than 150 centimeters. The South African Bushmen also average more than 150 centimeters in height. The Australoid Pygmies have an average stature very similar to that of the Bushmen.

TABLE I

AVERAGE STATURE OF THE SHORT RACES OF MEN

Group, Locality, etc.	*Stature (Centimeters)*	*(Inches)*	*Author*
Negrito Pygmies			
Zambales, Philippine Islands	146.3	57½	Reed
Bataan, " "	145.4	57	Barrows
Batak, " "	150.0	59	"
North Andamanese	148.6	58½	Census of India
South Andamanese	148.2	58½	" "
Semang, Malay Peninsula	152.0	60	Annandale
Mafulu, British New Guinea	155.1	61	Williamson
Tapiro, Dutch New Guinea	144.8	57	Wollaston
Toricelli, New Guinea	150.9	59½	Schlaginhaufen
Goliath Pygmies, New Guinea	149.2	58½	Wollaston
Pesechem, New Guinea	152.8	60	Van den Broek
Morup, New Guinea	150.5	59½	" " "
Kamaweka, New Guinea	148.7	58½	Seligmann
Negrillo Pygmies, Equatorial Africa			
N'Gali (Ba-Binga)	148.0	58	Poutrin
M'Bio (Ba-Binga)	155.1	61	"
Lobaye (Ba-Binga)	148.6	58½	"
Ba Tua (pure)	152.2	60	"
Bambute, etc.	149.7	59	Johnston
Batwa (mixed)	159.8	63	Czekanowski
Baamba	157.3	62	"
Mawambi	140.8	55½	"
South African Bushmen			
Heikum and Kung	155.3	61	Werner
Kung	156.4	61½	Seiner
Ogowe	153.3	60½	"
Heikum	152.5	60	"
Australoid Pygmies			
Senoi, Malay Peninsula	152.0	60	Martin
Veddah, Ceylon	153.3	60½	Sarasin brothers
Toala, Celebes Island	156.1	61½	" "
Indonesian Type			
Nabaloi, Philippine Islands	149.1	58½	Bean
Kankanay, " "	150.6	59½	Barrows
Manobo, " "	151.8	59½	Montano
Ifugao, " "	155.2	61	Barrows
Bontok, " "	155.0	61	Kroeber
Mandaya, " "	153.9	60½	Cole
Bilaan, " "	154.7	61	"
Tagbanua, " "	155.0	61	Barrows
Ulu Ayars, Borneo	155.1	61	Hose and McDougall
Kalabit, "	156.1	61½	" "
Kayan, "	155.0	61	" "
Maloh, "	158.5	62½	" "
Torajda, Celebes Island	159.8	63	Sarasin brothers
Tomekongka, " "	156.9	61½	" "
Tenggerese, Java	160.0	63	Kohlbrugge
Orang Kubu, Sumatra	158.7	62½	Hagen
Arctic Mongoloid Type			
Lapps, Norway	152.3	60	Mantegazza
Lapps, Russia	155.8	61½	Anutschin

In Table II (page 692) the nose form of these races is compared. All of the groups recorded, with the possible exception of the Lapps, have a low, broad nose. We are accustomed to regard this as a Negroid characteristic but such a conception leads to confusion. A low broad nose is a primitive character universal in the Negro race, but by no means monopolized by that group. The Australoid type and the Indonesian type both have a low broad nose. The South African Bushmen have probably been the least successful of the living races of man in developing a nose. The nose bridge, very low in other Negroid groups, is almost flat in the Bushmen. In the African Negrillos and Bushmen the width of the nose is greater than the height (indicated by the nasal index being in excess of 100). Excepting the Philippine Negritos, the Oceanic Negritos have a somewhat narrower nose but still much broader than the nose of Europeans and Mongols. With the exception of the Senoi, accurate data on the nose of the Australoid Pygmies are wanting. But from the photographs of these groups it is very evident that they have broad low noses. The Indonesians have a nose which rivals that of the Negro in the ratio of breadth to height. To my mind this does not indicate Negro affinities but merely the retention of a primitive character independently in these groups.

The head form of Pygmies is also of interest. As a group the Negroes have long narrow heads, but the Pygmy Negritos and Negrillos tend to have a somewhat wider head. This characteristic is expressed by the cephalic index which records the width of the head in terms of percentage of the length. In Table III (page 693) we note that the Philippine Negritos and Andamanese have very wide heads. The Semang Negritos and the New Guinea

TABLE II

NOSE FORM OF THE SHORT RACES OF MAN EXPRESSED BY THE NASAL INDEX

(The nasal index expresses the width of the nose in terms of percentage of the height of the nose. A large index denotes a broad nose while a small index denotes a narrow nose)

Group and Locality	*Nasal Index*	*Author*
Negrito Pygmies		
Bataan, Philippine Islands	94.7	Montano
Zambales, " "	106.0	Reed
Batak, " "	97.0	Barrows
North Andamanese	92.5	Census of India
South Andamanese	88.2	" "
Semang, Malay Peninsula	97.0	Annandale
Mafulu, British New Guinea	83.8	Williamson
Tapiro, Dutch New Guinea	81.4	Wollaston
Goliath Pygmies, New Guinea	83.9	Van den Broek
Pesechem, New Guinea	83.2	" " "
Morup, " "	88.1	" " "
Negrillo Pygmies, Equatorial Africa		
N'Gali (Ba-Binga)	105.0	Poutrin
M'Bio (Ba-Binga)	105.0	"
Lobaye (Ba-Binga)	106.0	"
Ba Tua (pure)	111.0	"
Bambute, etc.	105.8	Johnston
Batwa (mixed)	86.9	Czekanowski
Baamba	86.2	"
Mawambi	91.2	"
South African Bushmen		
Heikum and Kung	102.5	Werner
Australoid Pygmies		
Senoi, Malay Peninsula	86.0	Martin
Veddah, Ceylon	Broad	Sarasin brothers
Toala, Celebes Island	Broad	" "
Indonesian Type		
Nabaloi, Philippine Islands	95.0	Bean
Kankanay, " "	88.7	Barrows
Ifugao, " "	101.9	"
Bontok, " "	99.8	Kroeber
Bilaan, " "	90.0	Montano
Tagbanua, " "	93.4	Barrows
Kalabit, Borneo	91.5	Hose and McDougall
Maloh, "	97.4	" "
Tenggerese, Java	100.4	Kohlbrugge
Orang Kubu, Sumatra	89.0	Hagen
Arctic Mongoloid Type		
Lapps	Medium	Deniker

Pygmies, for the most part, have somewhat narrower heads. The Australoid Pygmies and the Indonesians also have rather narrow heads. The Lapps have extremely broad heads.

While none of the Pygmies have straight hair, their hair form is by no means similar. The Negritos and Negrillos have typical Negroid hair, closely curled and frizzly. The Bushmen have an extreme type of Negro hair. The hair is much finer and more closely coiled. When stretched slightly it has the appearance of a very fine and closely coiled spring. The Australoid Pygmies have either wavy or curly hair. The Indonesians have straight or very slightly waved hair. The Lapps have straight coarse black hair. The Australoid Pygmies are characterized by an abundance of body hair. Some of the Negroid Pygmies also differ from the Negroes in general in having the body covered with short downy hair. This characteristic is reported for some African Negrillos and the Pygmies of New Guinea.

The Negroid Pygmies al o differ from the other Negroes in having a lighter skin color. The Bushmen have a light yellowish brown skin. The Negrillos and New Guinea Pygmies have a skin color much lighter than the neighboring Negroes and in some instances almost yellow. The Andamanese and Philippine Negritos are described as having more often a rather dark brown skin color. The Indonesians show varying shades of yellow-brown pigmentation. Again, the Bushmen and certain Negrillo and Negrito Pygmies also differ from the Negroes proper in having a convex upper lip.

I have figured (page 686) three skulls from the collection of the American Museum of Natural History, representing the three main types of Negroid Pygmies. From left to right they are a Congo Pygmy, a South African Bushman, and an Andamanese Negrito. These skulls are fairly typical of the groups they represent. In the top view they show a similarity in contour, all presenting an outline more or less rhomboid in form. This form is in part due to the narrow frontal region and the prominence of the parietal eminences. These may be regarded as infantile characteristics.

In the front view there are more marked differences. The nasal opening is narrower in the Andamanese skull. The African Pygmy and Bushman skulls have low broad nasal openings and the eye openings are widely separated. The Pygmy and Andamanese skulls have very high orbits.

In profile the skulls show a much more striking individuality. In the African

Pygmy the face projects beyond the brain case more than in the others. The Bushman face is nearly vertical. The Andamanese skull is intermediate between the two. All have a more or less vertical forehead but this characteristic is most pronounced in the Bushman. In all three skulls the mastoid processes, found just behind the ear openings, are small.

The cranial capacity, which may be taken as an index of gross size of the brain, is small in all the Pygmy types. The Veddah have the smallest cranial capacity so far recorded, 1250 cubic centimeters. The Bushmen are next in size with 1260 cubic centimeters. The average cranial capacity of the Andamanese is 1269 cubic centimeters, of the Philippine Negritos 1409 cubic centimeters, and of the Semang Negritos 1338 cubic centimeters. The average cranial capacity of Europeans is somewhat above 1500 cubic centimeters. Of course the small size of these Pygmies must be taken into consideration in connection with their small cranial capacity.

The Negritos and Negrillos have not been very successful in developing a chin. On page 694 are shown the lower jaws of a Congo Pygmy, an Andamanese Negrito, a South African Bushman, and a modern European. The first two have poorly developed chins. The Bushman, however, has typically a rather prominent and peculiarly pointed chin. In this respect he is almost as highly specialized as the modern European. No other Negroid group has the chin developed to such an extent as the Bushman.

We have seen now that, although the Negroid Pygmies have a few characteristics in common, they have, to a very large extent, developed local peculiarities which distinguish them from one another. The Bushmen, perhaps, have carried this specialization the farthest and differ more from the Negrillos and Negritos than do these two from each other. In fact, it seems clear that if the Bushmen are related to the Negritos and Negrillos, this relationship is a very distant one. The Australoid group, including the Veddah, Senoi, and Toala, are quite different from the Negroid Pygmies in several important characters. The Indonesian group of short stature are Mongoloid in their affinities. Many other groups of Mongoloid affinities have very short stature. Among these should be mentioned certain Siberian tribes, some American Indians in Mexico and South America, and the Eskimo. So then we have Pygmies or a tendency to very short stature in three distinct racial types. The Caucasian or European racial type alone has no marked examples of extremely short stature, except

TABLE III

HEAD FORM OF THE SHORT RACES OF MAN EXPRESSED BY THE CEPHALIC INDEX

(The cephalic index expresses the width of the head in terms of percentage of the length of the head. A large index denotes a wide head and a small index a narrow head)

Group and Locality	*Cephalic Index*	*Author*
Negrito Pygmies		
Bataan, Philippine Islands	84.7	Montano
Zambales, " "	82.2	Reed
Batak, " "	81.0	Barrows
North Andamanese	82.5	Census of India
South Andamanese	83.0	" "
Semang, Malay Peninsula	77.9	Annandale
Mafulu, British New Guinea	80.0	Williamson
Tapiro, Dutch New Guinea	79.4	Wollaston
Toricelli, New Guinea	77.7	Schlaginhaufen
Goliath Pygmies, New Guinea	83.4	Wollaston
Pesechem, New Guinea	80.5	Van den Broek
Morup, New Guinea	82.1	" " "
Kamaweka, New Guinea	78.1	Seligmann
Negrillo Pygmies, Equatorial Africa		
N'Gali (Ba-Binga)	78.1	Poutrin
M'Bio "	79.7	"
Lobaye "	81.7	"
Ba Tua (pure)	78.1	"
Bambute, etc.	79.4	Johnston
Batwa (mixed)	75.1	Czekanowski
Baamba	79.8	"
Mawambi	79.6	"
South African Bushmen		
Heikum and Kung	76.3	Werner
Australoid Pygmies		
Senoi, Malay Peninsula	77.2	Martin
Veddah, Ceylon	75.1	Deniker
Toala, Celebes Island	80.4	Sarasin brothers
Indonesian Type		
Nabaloi, Philippine Islands	78.5	Bean
Kankanay, " "	81.6	Barrows
Ifugao, " "	76.9	"
Bontok, " "	78.4	Kroeber
Bilaan, " "	80.4	Cole
Tagbanua, " "	81.0	Barrows
Ulu Ayars, Borneo	74.7	Hose and McDougall
Kalabit, "	78.5	" "
Maloh, "	76.8	" "
Tomekongka, Celebes Island	81.8	" "
Tenggerese, Java	79.7	Kohlbrugge
Orang Kubu, Sumatra	78.5	Hagen
Arctic Mongoloid Type		
Lapps	87.6	Deniker

as individuals. But the Negritos, Negrillos, Bushmen, and Australoid groups alone are true Pygmies.

When considered culturally, most of these Pygmy tribes are undoubtedly very primitive. They are all in the hunting stage.

Lower jaws of the Negro Pygmy types compared with a European jaw.—From above downward are the jaws of a Central African Pygmy, an Andamanese Negrito, a South African Bushman, and a European. Of all Negro types the Bushman alone has succeeded in developing a chin. In this respect the Bushman is almost as highly specialized as the European

This fact has been largely instrumental in their being regarded as primitive anatomically and consequently as ancestral to mankind as a whole. Such a theory is due to a confusion of culture and anatomy. There is not necessarily any direct correlation between a primitive culture and a primitive anatomical structure. The two things are distinct and different. While we may have a primitive culture associated with a group having a primitive anatomical structure, the two are not related in the sense of cause and effect but are merely an association. Very few primitive anatomical characters found in modern man could influence culture to any great extent.

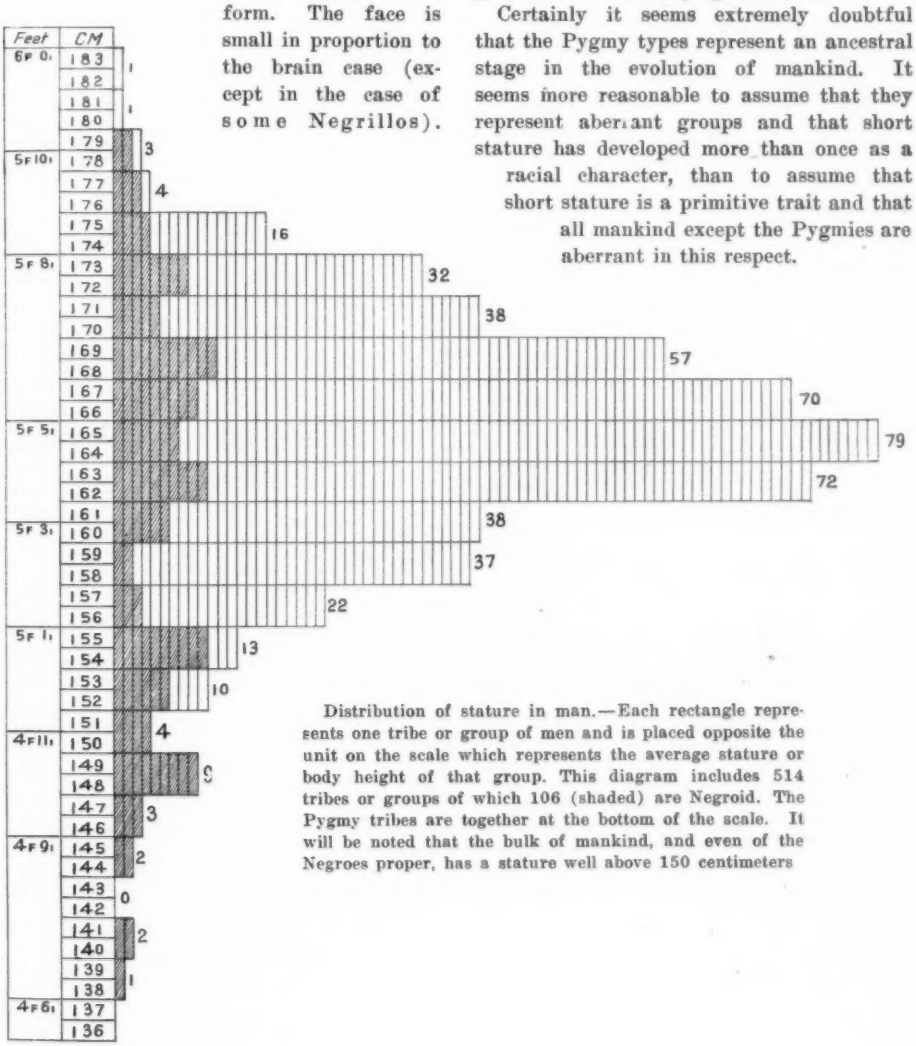
At the very outset it seems questionable whether short stature, the most characteristic trait of the Pygmies, is a primitive character. In the figure opposite is plotted the stature of mankind as a whole. Each small rectangle represents the average stature of one tribe or group of men. The average stature of 514 different groups is used. This should give us a fair idea of the distribution of stature in mankind. From about 150 centimeters to 180 centimeters we have a normal frequency curve with the greatest frequency at 164 to 165 centimeters. On the other hand, the Negroes, represented by the shaded rectangles, have an irregular distribution of stature with points of greatest frequency at 168 to 169 centimeters, 154 to 155 centimeters, and 148 to 149 centimeters. In other words, the bulk of mankind, and even of the Negroes proper, has a stature decidedly above that of the Pygmies. It is rather difficult to believe that only these few groups have retained the primitive form of stature while all the others have specialized in this respect. It is very seldom that such a thing occurs within a group.

Another proof that excessively short stature is not a primitive trait is found in the fact that the earliest types of man on whom we have any data for this trait were decidedly taller than the Pygmies. I refer of course to the Neanderthal race who lived in Europe during the Pleistocene. Their average stature was about 163 centimeters (5 feet 4 inches). Going back still further to *Pithecanthropus erectus*, a type showing certain characters of both the apes and man, we find a femur or thigh bone 45.5 centimeters long. This length of femur cor-

responds to a stature of about 5 feet, 7 inches, in man. In the upper Palæolithic, the Crô-Magnon race had attained a stature well above 6 feet.

The Pygmies do, however, present many primitive traits. They accentuate some of the infantile characteristics of the Negro group. In more than one respect they suggest a group whose development in certain particulars has been retarded. The brain case is infantile in form. The face is small in proportion to the brain case (except in the case of some Negrillos). Taken all together they are no more primitive than other Negro groups and perhaps slightly less so. Anatomically it is by no means clear that the Negro race is the most primitive. Certain Australoid and Mongoloid groups seem, on the whole, to approach more nearly to the generalized type of mankind. The extremely dark skin, the absence of body hair, the closely curled hair, thick lips, and the form of the calcaneum in Negroes are undoubtedly specializations.

Certainly it seems extremely doubtful that the Pygmy types represent an ancestral stage in the evolution of mankind. It seems more reasonable to assume that they represent aberrant groups and that short stature has developed more than once as a racial character, than to assume that short stature is a primitive trait and that all mankind except the Pygmies are aberrant in this respect.



Distribution of stature in man.—Each rectangle represents one tribe or group of men and is placed opposite the unit on the scale which represents the average stature or body height of that group. This diagram includes 514 tribes or groups of which 106 (shaded) are Negroid. The Pygmy tribes are together at the bottom of the scale. It will be noted that the bulk of mankind, and even of the Negroes proper, has a stature well above 150 centimeters

GROUP IN THE AMERICAN MUSEUM, SHOWING A PYGMY CAMP IN THE CONGO FOREST

Nomad Dwarfs and Civilization *

A STUDY OF THE PYGMIES OF CENTRAL AFRICA

By HERBERT LANG

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FOREWORD—A splendid habitat group representing a Pygmy camp in the Rain Forest of the northeastern section of the Belgian Congo has recently been installed in the American Museum of Natural History. The scene depicts a lucky hunter returning with his faithful companion, a hunting dog, to the family circle consisting of a wife, two children, and an aged mother. There is thus given to the public, always eager for information about primitive types of man, an opportunity to become better acquainted with the Belgian Congo dwarfs, who still manage to eke out their meager existence in the primeval forests of Africa. The building of the group was made possible by the fact that the American Museum Congo Expedition, although chiefly zoölogical, had a wide range of activities and gathered during the six years of its stay (1909–1915), material and information necessary for the reproduction of Pygmy life. The group was designed and executed by Mr. Frederick Blaschke under the supervision of Director F. A. Lucas and the direction of the Author.

Especially interesting is the fact that the lifelike qualities of the new group are partly the result of the intelligence of the Pygmies themselves. They were the first to contribute to our valuable collection of more than 100 life masks representative of 16 different tribes of Central African races. Mr. James P. Chapin, my only white companion and an excellent linguist, explained to the first Pygmy we saw that we should like to reproduce his face by covering it with a layer of "soft, white mud" (plaster of Paris). Although apparently frightened, the little fellow suggested that before having his eyes and mouth covered with "mud," he would like to see it put on his hand or foot. The completed cast aroused his admiration, but he hastened to add that the cold plaster had become so uncomfortably hot when setting that in his mind fear arose that he was to be broiled alive. From then on, however, we had less difficulty in taking casts, and although the tall Negroes invariably became nervous and often trembled during the process, Pygmies submitted with comparative confidence.

Emandinia, chief of the Nala Pygmies, in reply to compliments on his equanimity while having his cast taken, said that fear to him was needless. Was not the white man alone, and Emandinia supported by one hundred well-tried archers, six of whom had never missed their mark? These are the bowmen shown in the photograph on page 705; they took aim at me but never released their arrows.

A counterpart of this was my experience with the Logos, when Maruka, an extremely agreeable but shrewd chief, made no objection to having his face cast, although his twelve councilors would not allow it unless they could assist, fully armed with spears, bows, and arrows, as is their custom in war. Much to their satisfaction, I invited them to be present—on condition, however, that five additional casts should accompany their chief's to America; and as the Museum enlarges its series of exhibitions, reproductions of these men may take their places in scenes representing native Negro life.—HERBERT LANG.

FROM time immemorial the imagination of poets has enriched the literature of many nations with legends of bearded, benevolent dwarfs, impish mountain sprites, and winged fairies, endowed with supernatural power and with passion for love and revenge. Today it is thought that perhaps some of these charming tales had their origin more in truth than in fiction. Homer's account of Pygmy nations, said by Aristotle to dwell beyond the lakes above Egypt, from which flows the Nile, was apparently not based upon mere fancy. More than two thousand years later, in 1870, Dr. Schweinfurth,[1] during his memorable exploration in what is now the northeastern section of the Belgian Congo, discovered the "Akkas," perhaps remnants of that very race renowned in verse, and now known as the Central African Pygmies.

For centuries Africa's black sons have struggled with the horrors of famine, cannibalism, war, and slavery, while the white man has slowly evolved civilization. The Mediterranean region and eastern and southern portions have been well enough known but the vast area south of the Sahara has only lately received serious attention when European nations have taken a more active interest in their southern neighbors. Thus within the last few decades, the Dark Continent has been forced to surrender one by one its well-guarded mysteries.

Colonizing efforts, however, in Central Africa have continually had one great check, more formidable than a Chinese wall: the white man can seldom bear for any length of time the hot, moisture-laden atmosphere or escape the many diseases lurking in the equatorial forests. In West Africa all along the routes of the Caucasian's advance are the silent witnesses of indomitable life and eager adventure come to tragic termination. To prevent loss of life and to temper the zeal of an administrative staff which forms the pillars of colonization,

[1] Georg Schweinfurth. *The Heart of Africa*, Vol. II, p. 122. New York, 1874.

* The illustrations are from photographic studies of Pygmies made by the Author during the American Museum Congo Expedition.

GROUP IN THE AMERICAN MUSEUM, SHOWING A PYGMY CAMP IN THE CONGO FOREST

the wise decisions of a responsible government have now limited the residential period to two years. White man's impetus must be the motive to progress, whereas the Negro will supply the activity to bring final order from chaos. Northern, southern, and eastern Africa have in part been made a white man's country, but the great, steaming equatorial forests will long remain the stronghold of the Negro race, just as they have been the refuge of the Pygmy.

The Origin, Distribution and Classification of Pygmies

Dwarfs are far more widely distributed than any of their respective discoverers supposed, independent or mixed with a taller element throughout a large part of the world. New Guinea, the Philippines, southern Asia and the adjoining islands, all these have their typical Pygmy population, the Asiatic and Oceanic branches called "Negritos," as differentiated from the Africans, the "Negrillos." Distinct traces of them have been found in many regions and MacIver[1] reports them to have been fairly numerous in Egypt between 6000 and 4000 B.C. In prehistoric times a race of tiny men dwelt together with taller men in northern Switzerland, in France, and elsewhere in Europe. Sergi[2] records numbers of small people from the peninsulas and adjacent islands of southern Europe, existing even now. In the south of Italy and in Sardinia nearly 15 per cent of the men are rejected from military service because they fail to measure 5 feet 1½ inches. If height alone constitutes the determining factor, dwarfs are nowhere scarce, for southern Europe—and now even New York—has a large population of diminutive persons, especially among women, since 4 feet 11 inches (150 cm.) is the maximum height accepted by scientists for "Pygmy-dom."

The records of modern African Pygmies prove so heterogeneous that anthropologists have not yet been able to offer a final opinion as to their classification, although separating them into various groups. For the sake of expediency three large divisions may be recognized: the South African Bushmen, the Batwa of the Central African Lake Region, and the more widely distributed Pygmies of the West African Rain Forest. (A branch of the latter is the chief concern of this article.)

Photograph of two Pygmies who helped the American Museum Expedition. This picture might well serve to illustrate ancient stories of fairies and "little men"

The Bushmen of South Africa are usually set apart from the other Pygmy stock on account of their wide differentiation. How far this is owing to life in a different environment—for they are now restricted to the arid regions about the Kalahari Desert—or to an intermixture with the Kafirs and Herero, their neighbors, is a question extremely difficult to answer on account of lack of prehistoric evidence. If they had any affiliations with the other Pygmies it may be assumed that a separation took place in very early times.

As regards the Batwa of the Kivu and Tanganyika regions, most of them, according to Czekanowski,[3] clearly show the effects of interbreeding with Negros around them. An apparently purer stock is to be found in the less populated, volcanic regions where they have lived in practical isolation.

[1] Arthur Thomas and D. Randall-MacIver. *The Ancient Races of the Thebaid*, p. 87. Oxford, 1905.

[2] Giuseppe Sergi. Varieta Umane Microcefaliche e Pigme d'Europa. *Bullettino della Reale Accademia Medica di Roma*, Vol. 19, fasc. 2, p. 13.

[3] Jan Czekanowski. Anthropologische-ethnographische Expeditionsarbeiten in Öst-Afrika. *Zeitschrift für Ethnologie*, Vol. 41, pp. 594–595, 1909.

In the third center, the West African forest, the Pygmies are known by several names, depending on the tribe with which they live, most noted being Schweinfurth's "Akkas" (the Mangbetu name), or "Tiki-Tiki" (the Azande term), or "Mambuti" (the name given by natives of the Ituri region and now current with Europeans).

The question arises whether the Pygmies are merely degenerate types of Negroes and therefore of relatively recent origin, or the earliest type from which all taller African races have evolved, or one entirely distinct and as old as any living race. The first hypothesis finds little actual support although Sir Harry Johnston states[1] that "British anthropologists seem to be arriving at the conclusion that the Congo Pygmies do not constitute a homogeneous type of Negro clearly marked off from the main stock in the same way as the South African Bushman. They are rather arrested, infantile, or degenerate groups of the Nilotic or Bantu Negroes produced by the depressing conditions of the dense forest." Sir Harry believes "them in the main to be dwindled descendants of the earliest pioneers of the true Negro stock (as compared with the divergent Bushmen)."

Unfortunately nothing positive is known about the epoch when man first invaded Africa, and palæontological evidence from that country is most unsatisfactory. Even the origin of numerous implements and carvings of stone found in Algeria, across the Sudan, Abyssinia, the Congo Basin, and in South Africa, as well as that of the pictographs from Mauretania and South Africa, is much disputed. Granting that the Pygmies were really the first to roam over much of the eastern portion of the African continent, the theory that tall Negroes evolved from them is rather contradicted by the distribution of both the true Negro and Pygmy stocks. It seems more plausible to assume that Pygmies sprang up at an early period in Asia, accepted by many authorities as the cradle of primitive man. In the successive migrations of the human races remnants of Pygmies could survive to the present day in certain regions where a natural protection favored the preservation of their racial characteristics.

[1] *Liberia*, II, 1906, pp. 887–888.

The third supposition, then, that these African Pygmies are the approximately pure descendants of an extremely ancient race, is perhaps sustained by their morphological characters, and by modern considerations of the controlling factors of dispersal. Mammalian distribution may be called upon to furnish an excellent analogy supporting the fact that they have come to Africa by way of Asia. The okapi and water-chevrotain, whose closest relatives are known to have flourished in the southern portion of Eurasia in Miocene and Pliocene times, are today among the most typical West African forest mammals, and undoubtedly came to the continent from the northeast. Antelopes, which have undergone such a remarkable adaptive radiation in the Ethiopian part of Africa, ranging from the size of a rabbit to that of a bull, have, as generally admitted, also derived their original stock from Eurasia. It has been argued that with the advent in the northeast of the continent of the pastoral Negroes of Hamitic origin, the tiny pioneers were forced to a speedy retreat. The powerful and evidently well-organized "giants" probably showed such pride in the purity of their stock that they refused to enslave the vanquished for fear of sullying their own race. The Pygmies, thus forced to withdraw farther and farther, finally reached Central and South Africa. The northeastern or Ituri section of the West African forest area became the center from which the Pygmies roamed south and west in the wooded portion, a few reaching the Atlantic.[1]

Personal Experiences with Central African Pygmies

So far the most important information about Central African Pygmies has come from explorers and scientists who gained their knowledge either during rather short visits to Africa, or from a few especially fine individuals exported for exhibition purposes. The American Museum Congo Expedition had penetrated 1400 miles inland to Avakubi, before we finally came across our first Pygmy, who was being unjustly held on

[1] The earliest mention of West African dwarfs dates from Andrew Battell's record in 1625, followed in 1670 by that of Dapper, who speaks of the Bakke-Bakke in the kingdom of the great Makoko, situated, according to de Brazza, in the region where in 1865 Du Chaillu discovered his famous Obongos near the Ogowe River.

a charge of murder to shield an important member of another tribe; the victim with an arrow through his heart, had been found dead on the forest trail. The prisoner gladly answered questions in return for plenty of food, and the matted hair clipped from his head was shortly added to our collections.

A few weeks later, a caravan of Bandaka came to Avakubi with rubber and bundles of rattan. Among them were two groups of about fifteen Pygmies each, who, after we had carried on a long and difficult palaver with them, allowed three of their men and two women to remain with the expedition. Without delay these turned to the task of building a shelter; and in scarcely an hour they had completed opposite our tents the usual beehive-shaped hut, arranging in shingle fashion the big *Phrynium* leaves on bent sticks held together with vines. Their rapidity and curious manner of working attracted a merry crowd of porters and members of the expedition. No wonder that later in the evening the leader of the Pygmies complained bitterly to me of the annoyance, and that next morning he and his little band had disappeared! This incident is typical of the difficulty we had at first in keeping the Pygmies with us long enough to study and understand them.

Joseph, the tall Bantu, belongs to the sturdy race of Bakusu at Stanleyville. Son of a chief, he was a devoted and trustworthy helper, and acted as headman for the American Museum Expedition, playing the part of a peacemaker rather than that of a leader. The short man, Papai, is offspring of a Pygmy mother and a Bantu father, but always resented being called a Pygmy, although according to custom he had been returned to his mother's tribe when a child. During the long years of the expedition this man made many friends among the natives we met. Once the confidence of Pygmies is gained, their friendly off-hand ways are a pleasant introduction to the happy-go-lucky life of these hunting nomads

Later we saw several other groups at Avakubi and Medje, and three years later, after our return to the forest from the Sudan and Uele plains, we often had hundreds of the small folk about us. The several years of constant contact and friendship which we had had with the natives spoke well for our reputation, and the Pygmies of Ngayu, Medje, Niapu, and Nala eagerly helped us obtain some of the rarest mammals. Most surprising was the way in which they secured the rare, great scaly anteater (*Manis gigantea*), and the aard-vark (*Orycteropus*), the latter a plains animal not known before to occur in the Rain Forest. With swaggering defiance a youngster of only eight or ten years would enter one of the animal's narrow burrows, from 8 to 20 feet in length. Down into the subterranean channel, with his dagger-like knife drawn, he would grope for a victim, while we outside expectantly listened and watched. True to the tradition of the fighting quality of his race, he would not let the battle in the dark go against him—and the creeper he held as a signal for assistance and the long, flexible rattan tied to his belt always proved unnecessary precautions. A lively time would ensue after the animal had been fastened to the rattan, and the crowd without would boisterously begin jerking it from the ill-smelling cavern. The little Pygmy hero, pushing and pulling from behind, would finally emerge amid the cheers of his comrades. But as usual the witch doctor took as much of the credit as the plucky boy: had he not foreseen the glad event and specified the most propitious time?

Physical Distinctions between Pygmies and the Tall Negroes

Descriptions, apparently authoritative, too often make us believe that there are striking differences between Central African Pygmies and the tall agricultural Negroes. But when we come to see crowds containing both Pygmies and tall Negroes, most of the so-called "clear-cut" Pygmy features prove to be individual or regional characteristics. From time to time I heard officials of many years' experience in Central Africa make the sweeping statement that they could pick out a Pygmy from among hundreds of other natives. Sure of proving the contrary, I changed the hairdresses, bark-cloths, amulets, and other decorative features of a number of Pygmies and Bantus. Thus in less than ten minutes it became impossible, or at least very puzzling, for these "experts" to make good their boast; the few physical peculiarities there were had escaped their notice.

The northeastern portion of the Congo Basin now rivals America as a racial melting pot. The incoming northern elements and the Bantu, Nubian, and Hamitic races have all contributed to what might be called a forest type, generally brachycephalic, in which the Pygmy is not a stranger. It is likely that in the future the Pygmy will gradually lose his identity and disappear in this melting pot, not even retaining what is supposed to have been his most obvious character—diminutive stature.

Looking at Pygmies in numbers, we are impressed by the fact that size alone cannot be the criterion for distinction. Of thirty-three adult males measured, none of them exceeding 4 feet, 11 inches, the average was 4 feet, 8 inches, which, with seven tall Pygmies included, at once rose to 4 feet, 10 inches. Emandinia, the chief of the Pygmies of Nala, measured 5 feet, 5 inches, a fair size even for a European. As is the case the world over the women on the whole are shorter than the men, but with the Pygmies the difference is even greater than usual. In not a few instances the striking disparity may be accounted for by the customs prevalent in their intermarriage with the tall Negroes. Women in these regions constitute the only important treasure, and chiefs of the Bantu tribes have never had any compunctions in adding

In the great African forests game animals are few and far between. The experienced Pygmy reads their presence in almost imperceptible traces—a cut leaf or a pebble displaced may be the signal for stealthy pursuit. Climbing trees in his own fashion, he varies his bill of fare with honey of wild bees, a few acrid fruits of rubber vines, and fat young nestlings. Also he traps monkeys, genets, squirrels, and birds in snares skillfully arranged in trees

pretty Pygmy girls to their harems. In most of these cases the sons return to the mother's tribe, whereas the daughters, considered a valuable asset, remain with the agricultural Negroes. These marital relations naturally help to increase the influence and prestige of the Pygmies. On the other hand, it would be "taboo" for a Pygmy to marry a woman of any of his tall friends.

It would be too daring to describe as typical these remnants of a race which has not escaped continued mingling with large neighboring communities. Each successive wave of migrants has naturally left its imprint upon the Pygmies, checking certain somatological characters and molding others. As a result of the intermixture which is continually going on, a regional resemblance to the agricultural Negroes is clearly visible in the physiognomy. Human faces the world over may show the most varied expressions and where people of different racial characters are welded together slowly, it will always be difficult to present general, all-inclusive descriptions. At present no racial characters setting aside a

Permanent assembly camp near the village of Nabodia, an Azande chief at Nala. Along the northern limits of the Rain Forest the Pygmies have already adopted the architectural style of neighboring natives and have completely abandoned the beehive-shaped huts. On this particular occasion every Pygmy had been called in from the hunting camps in the forest, and the photograph shows the most important men and their helpers with whom I made arrangements for assistance in the expedition's work

To celebrate great success in hunting, Pygmies often visit the settlements of the tall Negroes who entertain them according to prevailing customs. In this Makere village they have selected a shady nook in a banana grove from which they sally forth for an occasional dance, even a mother with her tiny baby (right center) taking part. As a rule Pygmies dance singly, the men and women frequently forming separate groups, but there is little social convention among them

majority of Pygmies from the tall Negroes can be stated, and it is doubtful if physical traits have at any previous period been more uniformly pronounced. Not all Pygmies are so much smaller in size as to be readily distinguished from other Africans, and in the main they are not shorter legged nor have they longer arms than the forest Negroes. Not all of them are representative of the strongly prognathous type, and a projecting monkey-like snout, with chin nearly obliterated, is an individual feature with some Bantus in most of these regions. The Pygmies are not the only African race showing the flattened, broad-winged nose, which, lacking a bridge, sets off still more sharply a well-rounded or receding forehead. Their alertness, due to peculiarities of hunting in the forest, has impressed upon their physiognomy distinctive features, which, together with a generally long, convex upper lip, are sufficiently characteristic —although more often it is scanty attire and lack of body care which distinguish them from the tall Negroes. With good reason others have mentioned the "unsteady eyes with the brutal glare," causing an uncouth, indescribably strange expression.

Perhaps too much stress has been put by various writers upon the color of the skin, which varies from black to dirty yellowish brown or reddish yellow, these and intermediate shades being as common among neighboring tall Negroes as among Pygmies. Forest tribes, however, like the Bandaka, Mobali, Mongelima, Makere, and Medje, as well as those from the plains region, the Mangbetu, Azande, and Abarambo, contrast with the uniformly dark Nilotics. Pygmies' lips are dark and the pigmentation often extends to the gums, but the undersurfaces of both hands and feet are as light as in other Negro races. Even albinos occur, although they seem more numerous among the tall Negroes; at Poko, in the Bomokandi district, more than a dozen of them lived within a short distance of the Post.

Pygmies are hairier on the body than East African types, but the West African Negroes whom we saw, especially part Nubians, like the Mangbetu, Azande, and many forest tribes, have even longer beards and mustaches, and more hair on chest and limbs; they also show the oft-mentioned "lanugo" or body down. Undoubtedly hairiness is more usual with Pygmies, but among all males in these regions it seems to be rather an individual character, as with white men. The scalp hair varies just as in neighboring tribes, forming a thick felt-like cap of kinky black hair or, more rarely, dense patches and small, bare, meandering trails. A few Pygmies have hair of a distinctly reddish brown color, a feature not uncommon among the Negroes of the northeastern Congo basin.

Habits and Superstitions of the Pygmies; Relations with the Tall Negroes

The dusty, unkempt tufts of hair, not more than two inches long, are usually matted, and palm oil is more likely to be used for gustatory delights than to give gloss to the hair. Many Pygmies, however, favor the elaborate hairdresses so common in countries of Mangbetu culture. Illness and death are the sword of Damocles held suspended by intense superstition. A shaved head, especially in women, is a sign of mourning. In despair the cut locks are wantonly thrown in the forest trails, and although one may walk upon them with impunity, to pick them up would bring worse grief than that of the bereaved. At all other times, however, a single hair in the possession of an enemy gives him power to turn upon the original owner all the evil that witchcraft holds. No wonder that every particle from the body, a single hair or the parings of a finger nail, is carefully concealed or burned in the forest!

Pygmies in speaking of bygone days reckon time by reference to memorable incidents in their lives, such as floods, wars, and good fortune, and extent of time, of course, is not calculated in years. The aged, far more numerous among this kindly little people than among other Negroes, are highly respected, and many must be 70 or 80 years old, since in several camps we found four generations happily performing their respective duties. Throughout the region a beard with even a few grizzled strands entitles one to authority, and near Avakubi the fame of a tottering Pygmy was surely vested in the seven-inch growth framing his wrinkled face.

It is marvelous how successfully the Pygmy has fitted himself to the complexity of conditions among the more powerful Negro races, with whom in strife he has

somewhat the relations of the scalp-hunting Indian to the home-seeking white man. In Darkest Africa weaklings have always been mercilessly pounced upon and either killed or enslaved. But it must be understood that among the tall Negro races where cannibalism had become one of the basic features in the maintenance of society—however strange that may sound—men of extraordinary courage and cunning, like the Pygmies, who alone or in troops could be relied on as snipers, became in the forest regions one of the leading factors of power among the Bantu chiefs.

More than any other Negro, the Pygmy, with his freedom unchallenged, proves himself keen, fearless, and full of verve. But mark when he is confronted by a strange adventure. Posing with their trophy, the hero and his friend have listened to the camera shutter's ominous click. They consider this their lucky day for they rise unharmed from the ordeal of being photographed, more convinced than ever that the white man's weapons miss their aim

Pygmies are the children of the forest, awed by its mysteries, which their own superstitions foster and increase. Numerous dances, carried on as a rule at twilight, serve manifold purposes, most often to do honor to good spirits or to propitiate those believed to be opposed to them; but whatever the occasion, gayety usually dominates

On the other hand, in the open warfare of the plains area, by the very nature of things the Pygmies were of little importance. From reports by Schweinfurth, Junker, and Casati as to the great numbers of dwarfs in former years, it is clear that relatively recent invasions of the fertile outskirts of the forest by the Nubianized element, the Azande and Mangbetu, must have caused the rapid decimation of the tiny people. Old Akenge, the great chief of the southernmost Azande near Poko, proudly related to me how for years, before the advent of the Belgians, instead of hunting game for the usual store of meat, they had cleared the country of Pygmies. Secrecy and silence prevailed, and under cover of night they would hang around the camps of the unsuspecting dwarfs strong nets ordinarily destined to capture the larger antelope, and suddenly pouncing upon the little fellows, they would drive them into the ambuscade and spear them, entangled and helpless, like game!

The intricate relations of Pygmies with the tall Negroes are much the same everywhere. A superficial observer might call

The whir of a Pygmy's arrow is the crowning step in the pursuit of a victim, be it man or beast. In the forest consummate skill does not depend upon shooting at great distances, but on the ability to steal up under the wind, unheard, unseen, and never miss the fleeting chance. Even among Pygmies there are only a few who have the patience, daring, and energy for such accomplishment

No frenzied display marks the customary dances, where measured steps are accompanied by weird, reiterated songs and monotonous refrains. The din of the drum, beaten nervously, and of the rattles, shaken with much skill, sounds above the wild outbursts of the leaders who spur their audience to continued efforts. Men, women, and children show keen delight as they rhythmically move in the dance, but obstreperous youngsters, satisfied only with an extra wild frolic, often break away from the formal circle

them vassals, but as a matter of fact, they enjoy the independence of the irresponsible. Nobody holds them in high esteem, nor yet treats them with absolute contempt. Their natural vindictiveness and ability both to retaliate and instantly shift to safer places, make them redoubtable enemies. Acknowledged dexterity and intelligence in outwitting the foe are the secrets of their continued existence, for the Negro is inclined to respect this obscure power as much as he does brute strength. Had they any grievances they were mostly settled by a single arrow, successfully sent forth from the revengeful hand.

They never cared to feast on their human victims, who among cannibalistic Bantus became the rightful spoils of war. Considering that Pygmies usually adopted the customs of their neighbors, it speaks in their favor that they were the only race in the forest not habitually involved in the terrible practice of cannibalism. True children of the forest, success in the chase satisfied their craving for meat. A sincere fellowship among themselves did away with the miseries and horrors of tribal warfare, yet they were ever ready to ward off attack. They have been the losing minority—never masters, and yet never slaves.

Continued hunting has taught the Pygmy to be as quick as lightning. Swift of foot, brave and fearless, he succeeds where others face defeat. He rather eludes than braves his foe, and though he chafes under disappointment as much as the tall Negro, he shows greater patience and determination. Time being an unimportant element, he waits for a fair chance to slay his enemy, man or beast. His eagerness to protect himself is akin to the terror of a hunted animal; and when cornered he, too, fights to the finish.

In spite of his wonderful specialization in hunting, which with the Pygmies varies as much individually and is equally subject to hero worship as unusual excellence with other peoples, the Pygmy lacks initiative to a very marked degree. Taken out of his sphere, where though poor and shiftless as a Bohemian he knows he is a dominating factor, he rapidly becomes weak and wavering, not even able to escape degeneracy.

Tribal marks are a means of identification among Congo natives comparable with uniforms of soldiers in civilized countries, and that these and other decorations have deep significance for Pygmies is proved by their general adoption as recorded by all observers. Filed teeth, a circular block of ivory in the upper lip, elaborate tattoos, a perforated concha, and a bone crosswise through the nose are in favor according to tribal connections. Beads, bracelets, anklets and leglets of iron or brass, amulets, and ornate hairdresses mark the fashion; moreover in all decorative attempts the Pygmy is a poor imitator of the tall Negro.

Language of the Pygmies; Food, and Home

Time and again explorers have had the excitement of thinking that they had discovered a real Pygmy idiom, which, they hoped, might help solve the problem of racial affiliations. But now it is an established fact that Pygmies today have no language of their own. They always speak the tongue of the neighboring agricultural tribes. Very often they may use, out of sheer laziness, a sort of jargon which sounds like a different language. But when interrogated, they speak more distinctly, and it is discovered that two or three well-known dialects have been mingled indiscriminately. May not the curious clicking sounds, believed by some to denote Bushman affinities, have had their origin in the necessity for communicating during hunting, when oral language would betray their presence to wary game?

In these tropics of uniform climate, problems of housing and clothing seldom force themselves on the attention, and the Pygmy's foremost occupation centers in food, for on a well-fed body all passions and pleasures depend. They hunt to live, at dull times confident of future plenty, and during abundance, reënacting the story of the carcass over which the vultures fight and the hyenas yowl and laugh. Although not epicures, they like a variety of food. Hunting falls to the lot of the men, fishing and the gathering of various tidbits to that of women and children. Mushrooms, yams, snails, and caterpillars are stewed in palm oil, and termites, wild honey, bee grubs, kola nuts, and fruits of rubber vine are welcome relishes.

Once in a while Pygmies may have shot an arrow into a neighbor's fine bunch of bananas to claim it as their own, or deposited a proportionate amount of meat in

PORTRAITS OF PYGMIES, BY THE AMERICAN MUSEUM CONGO EXPEDITION

The middle two are women. Ears, eyes, nose, lips, forehead, cheekbones, and chin vary in Pygmies to the same extent relatively that they vary in other races affected by continued influx of foreign elements; moreover, the length and density of the hair and, what is otherwise considered an even more reliable racial feature, the color of the skin, are subject to variations. So far as their much talked of hairiness is concerned, a scrutiny of the faces and chests of even the few men portrayed on this and the following three pages proves that no fixed rule can be applied. These have been chosen from a series of ninety sets (each of which consists of front, side, and three-quarter views). How we eliminated personal preference and prejudice in the selection of the hundreds of natives photographed in the field is explained on the next page.

Patience and tact overcame most obstacles in dealing with crowds, and the slightest amusements transformed unpleasant delays into joyful occasions. Gifts to the musicians were the means of engaging the Pygmies in dances before they even thought of fleeing the dreadful experience of being photographed, and a reward for the story that would cause the greatest number to laugh seldom failed of its purpose. To simple kindness they responded with confidence, and it was not by the exercise of power that unruly, cunning natives were most easily handled, but by a reputation for absolute fairness

FOUR MEN OF THE PYGMY RACE

Great is the temptation for a traveler to pick and choose the subjects for his picture gallery with an eye to beauty and interest. But we were anxious that our anthropological series of portraits should not be invalidated. After carefully ascertaining the tribal status of natives, we lined them up indiscriminately and took every third, fifth, or seventh individual according to the number desired from any crowd. As a reward and to keep them in good humor, those photographed received presents of salt, gilt nails, beads, or other trinkets, and although none liked to be photographed, all were willing to take the chance braved by others.

Their superstitions were not solely concerned with the "evil eye" of the camera but had a much wider range. Once a Pygmy chief asked if it was not dangerous to expose to daylight the spirit residing within the camera. I removed both lens and ground glass and passed a stick through the instrument to give him proof of the absolute emptiness of it, yet he clung to his belief in the presence of a power for evil, adding that it was evidently harbored in the dark cloth of the bellows and could be destroyed only by fire. Even the thought of sitting on a stool previously occupied by a chief seemed to disturb these little fellows, but my handkerchief merely placed on the seat was sufficient to dispel the charm and restore their childish confidence

PYGMY DWELLERS IN THE CONGO FOREST

The second figure from the left is a woman. The hat worn by the man at the right recalls an experience which illustrates the unique position of Pygmies as regards their relations with their neighbors. A very large colony in Nala was led by this old chief whose wisdom must have been equal to his age to command the respect he enjoyed. His truly original appearance prompted me to take his photograph. Matted patches of crinkled hair straggling from beneath the tattered bits of hat harmonized with his frizzly beard and the few brown rags about his waist. Mr. Petronio, in charge of the Post, in his desire to assist, thought that the slovenly Pygmy was not worth a plate in that condition and taking from an onlooking Mayogo chief his brand new hat, trimmed with a highly prized tuft of red parrot feathers, he placed it on the Pygmy's head. Imagine our surprise to learn that we, as well as the Pygmy, had broken conventions dear to the heart of the Bantu. The owner of the borrowed headgear haughtily refused to take back what a Pygmy had worn for even so short a time. We laughingly paid to the Pygmy, who also refused to keep the hat, salt to the value of ten cents, and added the ownerless article to our collections. After endless discussions among themselves, the Mayogo chief finally accepted two heavy, brass anklets, worth about fifty cents, as an atonement for his injured self-respect

exchange for what they took from the plantations, but today most Pygmies bring their goods to the villages of the tall Negroes and with little serious altercation barter for mere trifles until darkness puts them to rout. The meat, medicine plants, fibers, and other products of the forest gathered by the Pygmies are gladly exchanged for plantains, manioc, and maize. Plantain cider or palm wine gives them too the exhilaration enjoyed in their dances. Honest among themselves, they nevertheless appreciate the cleverness involved in outwitting others, in complete disregard of principles of fair play.

Primarily hunters, they continually shift their camps to obtain the best hunting grounds. The site, old or new, is always cleared in the high-lying, open forest, near one of the numerous clear brooks; huts are either built beforehand, or old ones are quickly restored to satisfy their meager needs for housing comforts. Every new trail means new joy. Indeed, the nomad's life is easy, Pygmy women are not fettered by hard work at home, and household articles are few. Knives and pieces of bark cloth receive first attention, and as the mother starts on her way she hoists a tiny child astride her waist, where he sits grinning with delight although the narrow supporting strap mercilessly indents his flesh. Another woman loads on her back bunches of plantains, manioc, and maize, surmounted by a pot, and fastens to her arm a sleeping mat, a calabash, and perhaps an old basket. Mortar and pestle, ax, horn, rattle and a drum for merrymaking fall to the share of the boys and girls. In single file they set out, a youth leading, and one or two able-bodied men bringing up the rear. With a dagger tucked in the belt, a quiver of wooden or iron-tipped, poisoned arrows suspended from the shoulder, they thread their way, with bow and two or three arrows in the hand always ready for instant action. Under care of the old, an ember is carried from camp to camp to perpetuate their fire, said to be obtained when strokes of lightning set aflame the gigantic trees—although Pygmies living in the plains are well acquainted with the art of making fire.

The silence of the march along the trail is broken by the yelps of the dog, which, raised to be eaten, has become nevertheless a highly prized helper in the daily raids on game. Indeed a good hunting dog in some regions is gladly accepted in payment for a wife. The place of the dog in hunting is peculiar. At the time he is started on a fresh scent a large wooden clapper is put around his neck. The noise of this clapper as the dog routs the game gives the master in ambush assurance that his arrow has a chance to hit the mark. If the dog returns to camp with clanking bell, all know from afar the jubilant news. Or should the dog be led astray in the heat of the chase the noise of the clapper makes his recovery easy.

In the forest, trapping and still-hunting are methods equally in favor. The slaying of a leopard near our camp on the Nepoko River—a leopard which had brought grief upon the village by killing the chief's daughter and two other women—justified the Pygmy's reputation. Suddenly the beating of gongs roused the whole neighborhood and a throng of exuberant natives outdid themselves to welcome the hero. He happened to be a master of mimicry and by gesture and a few, clear, short phrases vividly pictured the course of the hunt. Deep in the recesses of the forest, on the trail leading to a brook, the leopard had devoured a small antelope, and then had gained its lair. Our hunter found it asleep on a low-hanging branch in dense foliage. He roused it by the splash of a stone flung into the water. With the whir of an arrow—and a gigantic leap of the spotted beast—the leopard's last struggle began. There were a few moaning roars, and then the silence of death betokened Ngalima's success; danger lurks no more on that path. With the conclusion of the pantomime, the rejoicing and dancing of the crowd continued until late into the night.

Although the privilege of chiefs to sit upon a leopard's hide makes such a trophy theirs by right, our gifts of beads, copper wire, and indigo cloth were considered a fair exchange. The meat, also the lumps of fat, a powerful, rejuvenating medicine greater in value than all else, of course became the hunter's prize. But what priceless treasure can be hidden in the leopard's heart which the Pygmy hunter has so eagerly claimed? We were soon to see, for, frantically yelling and dancing about, he waved in his hand the iron point of his own fatal arrow, which had been snapped off from the

FURTHER PORTRAITS FROM THE BELGIAN CONGO

From left to right the first and third are men. The wearing of stylish hats draped with waving feathers is the exclusive privilege of men among the Pygmies, but hairdresses, sufficiently grotesque, adorn both sexes, and as women are most skilled in this art, married men have a decided advantage in that respect. The matted, kinky hair, to which oil is often applied, is usually cut fairly short. Like the tattoos of other peoples, raised weals, in these regions a necessary adornment of women among their neighbors, are often completely dispensed with, although of the two women pictured on page 707, one shows a line and star about the shoulders and the other a decorated forehead. Pygmies, however, are far less fond of decorative effects than are the tall Negroes. The face of the woman at the extreme right is painted with "bianga," the juice from a forest fruit (*Gardenia*) blended into an ink-like fluid with charcoal; such patterns remain for only a few days.

Although these portraits bring out the more general characteristics of the Pygmies, space is lacking for a large comparative series, which would furnish conclusive proof of the physical variations in a race subject to continued modification

shaft in the leopard's struggle. Twice before it had pierced the hearts of enemies, and with the joyful grin of a devil he claimed that no foe of his could escape that magic dart.

Pygmies in the Ituri region do not often try to kill elephants with their arrows,—although a single poisoned arrow might fell an elephant. Instead, they eagerly find the site where through their cunning even this mighty beast will meet his fate. A huge section of tree trunk bearing a spear at one end is hoisted to a branch forty feet above the ground. Hidden in the entangling maze the lightly balanced truncheon betrays no danger. But a slight touch on the tiny unobtrusive vine connected with the release and stretched across the trail, will send the immense, armed weight crashing down upon the unsuspecting victim.

Or they locate the habitual resting places of solitary elephants and report their find to the tall forest Negroes, who then creep up on the tuskers and with a rush drive a broad, sharp-edged spear into the base of the trunk and quick as a flash fall back into the protecting jungle. The death of the elephant ensues from loss of blood within a few hours. But should the wound be slight, Pygmies, loath to abandon the prize, follow the victim for days, shooting poisoned arrows in an attempt to blind the great beast, and finally spear him at a propitious moment.

In testing their marksmanship a squash seven inches in diameter which I used, aroused their derision, and at a distance of forty yards not one of a dozen volunteers failed to send his wooden arrow through the target. At sixty yards, however, they asked for iron-pointed arrows to withstand the strong wind.[1]

All Pygmies, however much they may wander in hunting, have a more or less permanent home near the settlements of agricultural Negroes with whom they are connected. Fifty or a hundred may live together under a leader, benefiting by such unity, although occasional friction is unavoidable between groups serving under different Bantu chiefs. Each man claims one or two wives—three is the exception—and the great fondness for children is shown by the burdening of childless women with the drudgery, whereas mothers are treated with comparative consideration.

Old, grizzly-haired men, who held honors as chiefs in their youth, relinquish these honors apparently with no feeling of bitterness. They spend much time cheerfully helping to educate the children. The subjects of the tales told to the young are the spirits hidden in mysterious forests and the unknown dangers lurking in the jungle; and they encourage their young admirers to make traps, shoot arrows, and to wrestle.

Chieftainship among the Pygmies is generally considered hereditary, as among their neighbors, but without doubt the right to the dignity of chief would be of no avail could the claimants not back it with a muscular frame and cunning enough to stamp them as men most capable of keeping the wolf from the door; only thus can they preside over the destinies of these small and scattered communities.

No time-honored clearing in the center of the village has been set aside for their deliberations. Nor are there the dignity and order so common with the Bantu, whose auguries, however, the Pygmies use during palavers. Indeed, the Pygmy councils, from which the women are excluded, are only the stormy outbreaks of a vociferous, gesticulating crowd. When the commotion has finally subsided, a few may still dispute the

[1] Throughout the practice, a young Pygmy had amused the crowd by mimicking the sharpshooters. When asked to show his skill as a marksman he preferred to imitate the sufferings of an elephant wounded by arrows. With stiffened legs, and back in horizontal position, he made his arms serve as forelimbs—sometimes as ears—and with the help of his bow represented the trunk. At moments he was pathetically slow and at other times the eye could hardly follow his movements. Then taking the part of a duiker, he drew himself together, arched his back, tripped along for a few paces, and stopped suddenly, a splendid take-off of their peculiar, nervous movements. At twenty yards from the squash target he suddenly stood up and hit the mark, a feat announced with a savage yell and a loud thwack upon his forearm.

In the afternoon the little fellow admirably imitated an official, taking especial advantage of the latter's habit of accentuating his instructions with peculiar, abrupt gestures. When I asked him to mimic me he grinned happily. During the forenoon I had taken a number of photographs and my tripod camera was still standing in the shade. Without injury to the instrument he mimicked my every movement with just enough exaggeration to make everyone laugh. Finally he indicated that the "evil eye had seen well"—and now came the climax to the performance. The Pygmy he had pretended to photograph, instead of unconcernedly walking away, dropped to the ground, illustrating the native superstition that the "big evil eye" of the camera causes death. A block of salt laid on the "dead" man's stomach instantly resuscitated him and the two entertainers walked off joyously, but only after the clown had received a like reward.

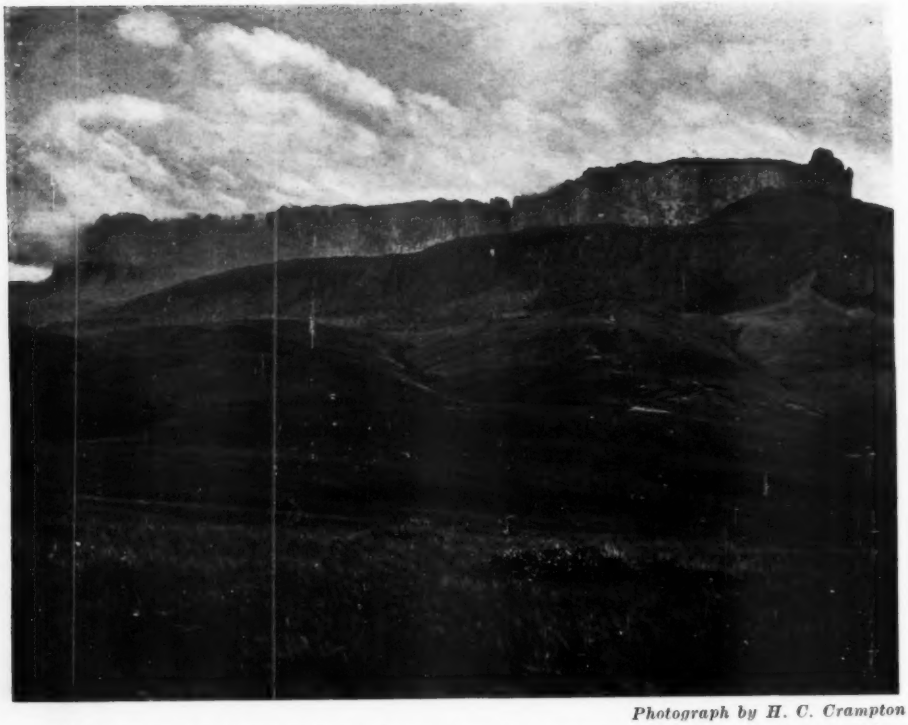
chief's dictum, which nevertheless is executed with expedition. Especially is the signal to clear out from camp obeyed with incredible celerity and uncanny silence. Not a sign indicates their whereabouts, and more surprising still is the return, when they suddenly swarm in from every side.

Pygmies have generally been considered shy, and except in a few regions they have been unwilling to come in numbers into government stations. In many skirmishes and in actual warfare they often turned the tide of battle for the Bantus by their unfailing aim as snipers. In the palavers ensuing, the tall Negroes were only too glad to unload on the dwarfs the responsibility for loss of life and wrongdoing.

Years of trials and tribulations have finally resulted in better relations between the Pygmies and the administrative officials. Far from being indolent and evasive, they have proved intelligent and willing to give up their nomadic life. As soon as they felt convinced that the Belgian government extended them freedom and equality with other natives, their villages and plantations looked in no wise different from those of the tall Negroes. They adopted the oblong type of hut, had their own blacksmiths, and the women had long ago learned to make pottery and wickerwork, and to perform other "household duties"—which include the clearing of roads leading to their settlements. From the small, irresponsible human devil that used to roam about aimlessly in the moisture-laden forests of Central Africa to this benevolent little gnome and responsive citizen of our day is a mighty stride.

Pygmies continually shift their camps in search of the best hunting grounds. The nomad's life is easy. There are few household goods to be moved. Some of the women carry the supplies of food with the cooking pot, and the sleeping mat; the boys and girls are intrusted with ax, horn, rattle, and drum; while the mother hoists the smallest child astride her waist where he is happy although the supporting strap may mercilessly indent his flesh.

Throughout heathen Africa motherhood is regarded as a special blessing. Among people so devoted to hunting as the Pygmies, sturdy manhood becomes all important; yet even so, girls are welcomed with greater joy than boys. Women, indeed, are the sole external expression of prosperity and wealth in these regions, and the relatively small number of wives the Pygmies own stamps them as paupers in the eyes of their agricultural neighbors



Photograph by H. C. Crampton

Mt. Roraima, the highest point of British Guiana, is a sandstone plateau eight miles long rising on perpendicular cliffs, down which tumble numerous cascades from the miniature lakes on its weathered top. British Guiana may be roughly divided into two low belts near the coast, and a mountainous interior for the most part heavily forested—except for certain grassy savannahs such as shown in the photograph. At the very foot of Roraima rain falls almost every day, accompanied by heavy winds. Here giant trees of the jungle give place to low gnarled forms with ferns and mosses in dripping festoons on every branch

Residential section of Georgetown with the governor's "palace" in the left background. Nearly every house is surrounded by trees and gardens giving the city a forested appearance from a distance. The flatness of the horizon of the coastal plain is noticeable in the skyline. In the foreground can be seen one of the open trenches of the city's sewerage system along the side of the street

. A Real El Dorado

BRITISH GUIANA POSSESSES NATURAL RESOURCES OF VITAL IMPORTANCE WHICH NOW LIE DORMANT

By WILLIAM J. LAVARRE

Illustrations from photographs by the Author

THE people of the United States are steadily awakening to the possibilities that are offered them for an increased commerce with South America. Reports come in, now and then, from various places; some of them say that Rio de Janeiro is to be the coming trade center of the continent, while others assert that Buenos Aires will rise more quickly in response to the commerce of the United States. If we draw a straight line from any part of the Atlantic coast of North America, say from New York, to South America, we find that it brings us to one of the three Guianas, either French, Dutch, or British. These are our nearest South American neighbors.

The forest Indian is seldom used as a laborer because of his small stature, but makes an excellent river-man and carrier and an indispensable guide in the interior [1]

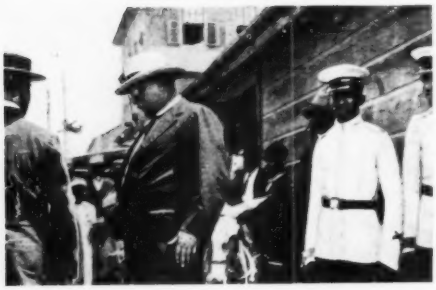
British Guiana is the most westward, and the largest of the three Guianas. It extends along the seacoast for 270 miles, reaches 500 miles into the interior, and is approximately 90,000 square miles in area. The topography of the country divides it into three natural regions: 1, the low coastal lands of marine alluvium rising gradually from the sea and extending from ten to forty miles inland; 2, sandy and clayey country of sedentary soil, with forests, swamps, and sand dunes, and traversed by a network of rivers and their numerous tributaries in which occur many rapids and falls; 3, the mountainous region, the eastern part of which is forested, and the southwest, an extensive area of flat grass lands elevated three thousand feet above sea level.

Each of these natural regions has its own special resources. The coastal belt, swept by the northeast trade winds, is excellent for agricultural and pastoral pursuits. The second and third belts are covered by an exuberant primeval forest, and are rich in mineral resources. On the vast savannahs excellent pasturage and sugar lands may be found.

Looking at the map of British Guiana, the striking thing about it is the network of rivers by which it is traversed. These at present furnish the only means of access to the interior. The western part of the country is occupied by a central mass of flat-topped mountains forming a series of terraces and plateaus. Mt. Roraima, the highest of these, about 8500 feet, has a nearly flat, grass-covered top of twelve square miles. The northwest portion is rich in gold deposits, and recently diamonds have been located in paying quantities along the upper Mazaruni River

Nearly the whole of the civilized population of the colony is located along the coast and on the lower banks of the larger rivers. Here, also, are located the present-day industries. The raising of rice and sugar cane, and the making of rum and molasses, are the chief occupations of the people. Coconuts thrive well on the coastal lands,

[1] The forest Indian raises his *benab* or shed anywhere in the bush, makes a small clearing for his wife's cassava field, and then spends his days in pursuit of tropical game. It is estimated that 15,000 aborigines are scattered through the Guiana forest, a remnant of the Indians whom the Spanish vainly attempted to enslave. The famous cannibals of the coast, the Caribs who gave their name to the sea, are virtually extinct after years of warfare against the white man.



The late Colonel Roosevelt in 1915 visited the Tropical Research Station of the New York Zoölogical Society at Kalacoon and was greatly impressed by the possibilities of Guiana, particularly its forest resources. The cultivation of rubber is gaining in importance each year. The establishment of experiment plantations proves that Para rubber will grow vigorously in almost any situation outside the flat coastal lands

The Botanical Garden in Georgetown contains an experiment station where scientists may come from any part of the world for study of the tropical flora in its natural habitat. The Garden serves also as the main park of Georgetown where the populace promenades on Sundays and holidays. The photograph shows two picturesque travelers' palms in the Garden

especially where the soil is sandy, and a considerable expansion of this cultivation is taking place. There are large areas of low-lying lands on which coffee grows splendidly, but the cultivation of this plant has been gradually abandoned through lack of sufficient labor. The establishment of experimental stations has demonstrated that Para rubber grows vigorously in almost every situation in which it has been tried outside the flat coastal region. It is estimated that there are 9,000,000 acres of accessible land, the larger part of which is eminently suitable for the cultivation of Para rubber. Lime-growing is still in the experimental stage; this fruit is at present growing excellently on the coast of the Essequibo River. There are also large areas of coastal lands that are well adapted to pastoral pursuits, but lack of proper drainage causes them to be inundated during the rainy seasons, January, February, and May, June, July.

Georgetown, the capital and only large city, is situated on the coast at the mouth of the Demerara River in the form of a rectangle two miles long and one mile deep, and is geometrically laid out in wide streets, running at right angles to each other.

When entering the harbor on my last trip to the colony, I was welcomed by the braying of an ass. The memory of that greeting voice still lingers with me, and, together with a recollection of open sewers flowing through the streets, it is one of the quaintly uncommonplace experiences that a visitor to the colony may have ere he departs.

Being at sea level, the city is protected by a wide sea wall, constructed by Dutch engineers during the last few years. Here, in the late afternoon, is the city's only rendezvous, and it becomes a promenade where the natives gather and listen to a rather egotistic bandmaster conduct his Negro-Hindu band through seldom recognizable variations of well-known compositions.

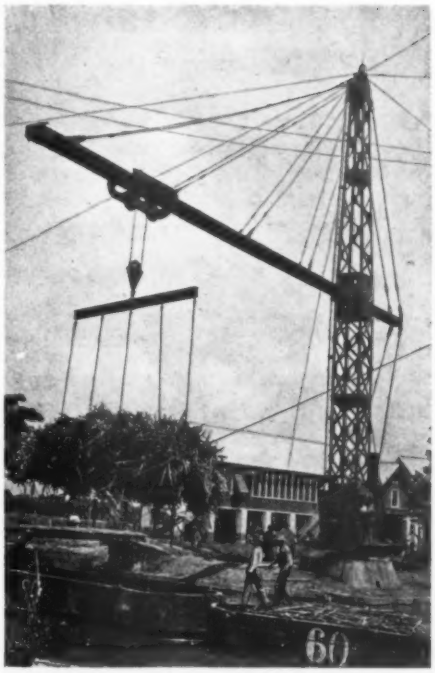
The city boasts of only a few luxuries,—an up-to-date ice plant, necessitated, most probably, by the inhabitants' ever present desire for strong and cooling drinks, a single track electric street railway, which has to wage a continual battle with a multitude of small and heavily laden donkey carts for the right of way, and a large and beautiful Botanical Garden and Experiment Station, where the tropical flora grows in lavish variety and abundance and is closely studied by scientists from many lands; it is here that men have learned many of the new things related to tropical vegetation. In 1917 a commodious moving-picture theater was built where one might go three nights a week and look upon heart-rending, blood-

curdling, or dully humorous scenes that had long since ceased to be appreciated in the United States.

The sewerage system of the city, as I have hinted, is one of great simplicity. In canals that flow through the streets, the waste of the city is carried to the sea, where at low tide it is emptied. When the tide begins to rise, the canal gates are closed, often causing the canals to overflow into the streets. These canals, varying from small trenches to deep streams, are crossed by arched bridges over each of which there are signboards prohibiting fishing,—but either the natives cannot read or they are too hungry to obey an unenforced law, for coolies, with feet dangling a few inches above the dirty water, may often be seen, sitting on the edge awaiting a bite at their lines.

The 60,000 inhabitants of the city make a very cosmopolitan population indeed. Negroes from the West Indies compose most of it, with a scattering of native Africans and their descendants, relics of slavery times. Coolies, indentured from India to work on the rice and sugar plantations, are conspicuous everywhere, dressed most often in their native attire, making the tourist feel quite as though he were not in South America but in India. Under this system of indenture these coolies sign themselves into a sort of conventionalized slavery for a period of five years, for which they are paid, sometimes, seven shillings a week. When this term of labor has expired, they must reside five years longer in the colony in order to be transported back to India at one half fare. By the time they have remained this period, though, all their money has been spent, and they usually either become paupers or do odd work here and there until they die, many of them from homesickness and disease. Portuguese and Chinese keep the small shops; Chinese keep general stores, but the Portuguese specialize in gin and other liquors. When a Portuguese owns a gin shop he is considered well off by his admirers! Europeans carry on the development of the colony.

Along the coast on either side of Georgetown are scattered many small settlements among which New Amsterdam, Berbice, and Bartica are the more important. From New Amsterdam and Berbice stretch numerous rice and sugar plantations. Bartica, a village with but one street and twenty inhabitants, is located at the junction of the Essequibo and Mazaruni rivers and is the "jumping off place" where men, going into the interior for gold and diamonds, depart



The chief industry of Guiana is the raising of sugar cane on the large plantations of the alluvial coast plain. Transportation is largely by water. Numberless rivers and streams traverse the whole colony while the coastal flats are intersected by a network of canals and ditches for draining off the excessive rainfall. The lower photograph shows the cane being deposited on a moving belt leading into the grinding room

Market Street is the main thoroughfare of Georgetown, the capital, port, and only large city of British Guiana. This town of about 60,000 inhabitants is relatively modern, except for its open sewerage system, and supports a good electric street railway and telephone service. The harbor (to be seen on the extreme right in the background) is the most important shipping point of northern South America, exporting large quantities of sugar, rum, rice, and some gold and diamonds. This picture was taken Sunday morning, which accounts for the deserted appearance of the street

Surface mining and lumbering are the sole industries of the forest region. The whole interior is auriferous. Diamonds are washed from the gravels of river beds by means of the "long tom" of the placer miner. Both the gold and diamond industries of Guiana are still in the prospector stage and carried on to a great extent by nomadic bands of Negroes (a description of the methods used in diamond mining in British Guiana appeared in the AMERICAN MUSEUM JOURNAL (now NATURAL HISTORY) for October, 1918, pp. 499–502)

Photograph by A. H. Verrill

The interior can be reached at present only by the rivers. They have many rapids in them which prevent large boats from making the ascent. Thus it is impossible to convey the necessary material for mining into the interior, but some day these rapids will be utilized as an enormous source of power for the development of the colony, and especially its mining industries

from civilization. Near here is the penal settlement from which a person may easily escape if he prefer to face the jungle rather than the rock pit. Kalacoon, the biological station, is also within a few miles of the town. Here Colonel Roosevelt spent several sleepless nights while shooting vampire bats with a twenty-two caliber rifle.

Situated as it is on the northernmost angle of South America, this country offers an immense economic opportunity to the United States. Its capital city has one of the best harbors on the continent save for the one fact that it has become clogged somewhat by a bar of mud brought down by the Demerara and Essequibo rivers. The authorities have made no attempt to dredge it or keep it free; they have, instead, been content with letting ship captains try to evade it, or wait until high tide to permit their ships to pass safely over the obstruction. Every once in a while a ship becomes entangled in the slimy ooze, and its exit or entrance from or to the country is thereby delayed. This harbor presents the difficulty of the Mississippi delta, only in a lesser degree; that has been overcome by up-to-date methods,—even more easily could the harbor

A wayside Hindu market, featuring cassavas and lemons.—Cassavas are parsnip-like roots, though somewhat larger than the parsnip and with much thicker skin. Boiled whole or ground into a meal which is baked, to remove the poisonous hydrocyanic acid contained in the juice, they provide the vegetable mainstay of the natives of Guiana. Salt fish, rice, and bananas are the other staples of the colony, supplemented by sweet potatoes and a good supply of fresh meat

of Georgetown be kept navigable for the larger vessels.

It is true that matters have been going from year to year with little advance. There seems to be a care-free languor about the country. Anything for the betterment of the colony is all right so long as it does not require much money or effort. Nothing like enterprise is to be found. Some have attributed this condition to the effects of the climate, but I do not believe that climatic conditions are wholly to blame, for England takes care of her African colonies with admirable success, and climatic conditions there are worse by far than in British Guiana.

British Guiana, from the time of Sir Walter Raleigh, has drawn many adventurers and promoters to her shores. Americans too, have gone there. They have taken with them American capital and American genius for opening up new lands, and have attempted whole-heartedly to place the colony at the head of its South American neighbors. But most of them were soon discouraged from further endeavors by the lack of friendly coöperation from the British Guiana officials. The governor in 1917 even went so far as to declare that he wanted no American capital in the colony. It is interesting to realize that at that time the American flag was flying over the Houses of Parliament in London as an appreciation of the aid that American dollars had given in the war.

A Hindu by-product of the vicious system of indenture—too old to work and too poor to pay his passage back to India. East Indians have been brought over since the abolition of Negro slavery, under agreements to labor on the rice and sugar plantations for five years at a stated wage, after which time they must remain in the colony for another period of five years if they are to be returned to India at one half fare. At the end of that time they usually have become paupers

American capital is certain to be encouraged in British Guiana, just as British capital enjoys the right of investing in American enterprises in the United States and in Alaska. When such conditions come to exist, the opening up of the interior will follow quickly. Besides containing much wealth in itself this country will provide highways over which intercourse of considerable commercial value may be established with northern Brazil, and by which Europe and the United States will gain access to large quantities of timber and valuable minerals, to say nothing of the possibilities of agriculture and cattle raising.

The first step toward this accession would be the building of a 250-mile railroad from Georgetown to the Brazilian frontier. This would mean, for one thing, that the Brazilian cattle, which by necessity are now shipped through the Takutu and Branco rivers to Manaos, and thence down the Amazon, could be brought to Georgetown less expensively and more quickly, where they could be killed and their hides tanned on the spot, or they could be shipped on the hoof to the United States and Europe.

On account of the nature of the country such a railroad would not be very difficult to build. An American company once offered to build it provided the government would give the company a franchise of every alternate mile along opposite sides of its course. The governor in reply said that the land would then be too valuable, apparently overlooking the fact that at present it is useless and always will be useless until such a railroad is built. Good railroads should also be built along the coasts, con-

necting the agricultural district with the central city and seaport.

Once the railroad to the Brazilian frontier is built, the development of the mining industry will come in quick succession. Because of the lack of facilities for transportation, the necessary machinery for working a mine is most difficult to convey into the interior, and so no real mining has been done. Gold has been profitably worked by both placer and hydraulic mining, but the only attempt at getting beneath the surface, accomplished in the Le Desire Diamond Mine, owned by Mr. Dudley P. Lewis and myself, was worked on a very primitive basis because it was located nearly 250 miles in the interior and could be reached only by paddling up a river the course of which was filled with treacherous rapids and whirlpools.

Bauxite has been discovered in large quantities; tin also has been located as plentiful in the interior, but for lack of transportation facilities nothing has been done with either of these ores. Gold and diamonds are the only minerals that have been prospected for extensively, usually by nomadic bands of Negroes termed "pork-knockers" because they go out supplied with only a little salt pork for food, and knock about the bush, hoping to stumble upon wealth. Even in the crude, meager way in which this sort of prospecting has been done, it has been a very profitable occupation and has yielded the government many thousands of dollars in royalties. The gold and diamonds may be mined with the roughest of tools, and when once acquired offer no great problem of transportation. An ounce bottle of diamonds would be a small fortune to a dusky pork-knocker. The gold that occurs so plentifully in quartz is usually passed by because of the impossibility of getting into the bush the crushing machinery necessary to extract it. The richness of the alluvial gold fields in this country is supposed to be due to the solubility of gold in the soil water. Mr. Harrison, geologist and general scientist of the colony, told me that to his mind, that vast interior of forest, mountains, and savannahs represents one of the richest storehouses on the South American continent.

Its great forest, containing such valuable woods as greenheart, wallaba, crabwood, and mora, would in itself be a valuable asset. Greenheart makes very durable submerged works such as wharves, piles and docks; wallaba can be very easily split and is chiefly used for shingles; crabwood, some-

These four "religious" members of the Mohammedan contingent were photographed while attending a Hindu ceremony. In Guiana the Hindus visit the Mohammedan ceremonies and vice versa, and both elements mutually participate in each other's feasts. The East Indian immigrants keep not only their religions but also their languages and costumes, in this way lending a very oriental touch to the population at Georgetown. (Photograph used through the courtesy of *Travel Magazine*)

times called "British Guiana mahogany," can be worked into very beautiful and exceptionally durable furniture; mora, a hardwood, is chiefly used for flooring and firewood. These woods are of exceeding consequence.

On the Potaro River (a branch of the Essequibo), about eighty miles inland, there is the magnificent waterfall, the Kaieteur, with a sheer drop of about 740 feet and a breadth of 350 feet. At some seasons of the year the water flowing over its brink attains a depth of twenty feet. This is the highest waterfall of any consequence that has as yet been discovered, and is more than four times as high as our Niagara. At present it is inaccessible to most people, but a railroad could quite easily be built to it; this would mean the possibility of developing a tremendous water-power station, surpassing the one that is at present located on the brink of Niagara, and power generated at this place could be utilized all over the colony, even running the railroads and the mines. A resort could also be established here, where people worn out by living on the coastal lowlands, might come and recuperate in the scenic highlands where the air is cool and the water pure and clear.

Many of these things seem visionary perhaps, until we realize that the building of a transcontinental railroad in the United States was considered impossible before it was accomplished, and to talk about reindeer being bred in Alaska was a subject for mirth ten or fifteen years ago. Today there are five transcontinental railroads in the United States, and reindeer are being bred so profitably in Alaska that reindeer meat can be sold throughout the northwestern states at a considerably cheaper rate than beef. All things are visionary until they are accomplished, it seems.

The late Colonel Roosevelt said in a lecture before the Royal Agricultural Society, on his last visit to British Guiana: "You have here a wonderful country! I can see it now, with homes stretching out over the savannahs and among the hinterlands. Set your minds to thinking and your hands to working and develop it!" Surely such a man as he did not speak idly but because he was far-seeing enough to realize the possibilities of Guiana.

Photograph by H. E. Crampton

Kaieteur Falls, set among the forested hills of the interior, make one of the chief scenic features of the province and the highest waterfall of any consequence as yet discovered. The Potaro River makes at this point a perpendicular drop of 740 feet, or about four times the height of Niagara, and continues by a series of cataracts with a farther fall of 81 feet. During the rainy season the stream is nearly 400 feet wide and carries a torrent twenty feet deep over the brink of the falls

Birds and a Wilderness

OBSERVATIONS OF THE EFFECT OF FOUR YEARS OF WAR ON A FERTILE COUNTRY, WITH SPECIAL REFERENCE TO THE BIRD POPULATION

By MAJOR ALLAN BROOKS, D.S.O.

MANY observers have had the opportunity to note the effect on wild life of the reclamation of a wilderness, as in the clearing and cultivation of a forested country; but it is seldom one has the chance to see the change effected by the reverse condition—the turning of a fertile country into a literally howling wilderness.

Eastward from Arras stretches the once fertile plain of Artois, quite unlike the much enclosed plain of Flanders—climate, soil, and methods of agriculture are all different. The soil, also unlike the clay of Flanders, is light, and underlaid in most places with chalk. Fences and hedges there are none, trees scarce and, except for a few large parks, usually confined to the borders of the main roads (I am speaking now of conditions before the war), and the houses of the farmers, instead of being scattered over the countryside, are congested into small villages, usually in a hollow, somewhat after the old Danish style one sees in the south of England.

It is not a pastoral country. Cows are always kept in barns, therefore no fences are needed. Grain and beets were the principal crops, and the bird life was such as one might expect in a cultivated prairie country. Let me now try to describe what this country looked like after being fought over for nearly four years.

One would expect to find a rank growth of weeds, volunteer crops of grain, and a large increase of bird life due to the cessation of all sport—the kind of sport that used to kill larks and finches galore. Instead, there was a rolling plain covered with grass, weed patches were very scarce, and volunteer crops had ceased to exist. The grass was usually short but sometimes quite rank in the hollows, and in many places a species of dewberry ran along the ground, fruiting plentifully.

The trees were all gone save for a few splintered stubs along the highroads; the ruined villages, being in hollows, did not usually show from a little distance: here and there low piles of shattered bricks and rubble indicated a village, but they were never a prominent feature of the landscape. The whole effect put one irresistibly in mind of our western prairies.

Just after our first jump in August, 1918, the plain near Monchy-le-Preux looked as if a rolling stretch of virgin prairie had suddenly been thrown open to settlers, and their wagons and encampments had flooded the country, the horse lines of our artillery looked like great herds of stock, and overhead the sky was as blue and clear as in Alberta or Dakota.

The lines of observation balloons struck the one incongruous note, for the circling planes looked like great hawks—and the birds added to the resemblance. Large coveys of partridges, sometimes fifty or more, whirred up like prairie chickens, and skylarks fluttered up out of the grass like longspurs. On the remains of the trenches and wire entanglements were a few loose congregations of migrating birds, whinchats which acted like bluebirds, a few black redstarts with a similar resemblance, pipits much like our own pipit, and an occasional shrike that might have been our own butcher bird. Raptores were very scarce, there being only a few hovering kestrels, and in the dusk a bobbing Athene owl, reminding one of the sparrow hawks and burrowing owls seen on a similar prairie in America.

The great flocks of seed-eating birds like finches and buntings which should have been in evidence were absent, with the exception of only a few scattered yellow buntings. Rooks and magpies, so common wherever the land is cultivated, were also absent, and starlings nearly so. Except partridges, all birds had decreased in number.

Of mammals, hares were common and, in their resemblance to jack rabbits, added to the prairie-like aspect of the country. Voles swarmed—a vole plague in fact, and domestic cats which should have been very much in evidence were gone with the inhabitants, although in Flanders there were plenty. Gas and gas shells apparently could not have affected the cats, for hares and mice showed no ill effects from the gas.

Birds also do not seem to suffer from gas in any form. A friend who was with the French during a very heavy cloud-gas attack put over by the enemy, observed that the only birds killed were the kingfishers along the stream, although the gas was strong enough to kill cattle miles behind the lines.

Also I failed to see a single bird victim of the chlorine gas attack of April, 1915. Up to the summer of 1918 I had invariably noted that birds seemed to be almost indifferent to shell fire, but now it was too much for even them.

Partridges (gray, I never saw the red-leg) were always in evidence during our attacks, their little brown figures skimming low over the ground, silhouetted against the gray wall of our rolling barrage, often among the legs of our advancing infantry, and many were killed. In every case I found actual wounds, none seemed to be killed by concussion, although this killed horses. With skylarks we found the same condition, all dead birds picked up showed the marks of shrapnel or fragments.

Hares, during these periods, were also absolutely panic-struck. One jumped right into the arms of our general's cook, and one can guess where it went after that. All dead ones picked up, like the birds, had wounds sufficient to cause death. But the underground mammals had the hardest time of all; one would have expected them to remain below, but the concussion must have been worse there, for they came to the surface during heavy cannon fire. When lying flat for obvious reasons, I often saw voles within a few inches of my eyes, and could take them with my hand—too paralyzed to move. Many were lying about dead without any visible wound, having died either of fright or concussion.

These intervals of intense gunfire were only short periods, for there were none of the bombardments lasting for days which were a feature of the war before this stage. In the long, quiet intervals one would expect to see more birds, but they were not much in evidence.

As we neared Cambrai the country was more wooded, with fine large reedy meres near the canals. This region had been cleared of all its inhabitants by the Germans on their first occupation, for a depth of ten miles or more. Here for four years there had been no cultivation, or next to none,—wide stretches of grassland between the belts of fine trees, open spaces, wood, and water, everything a bird would need, yet birds were as scarce as in the fighting zone.

But once we got through this and into the inhabited and cultivated country, like magic the birds were everywhere—sparrows, buntings, and finches—in ropes on the telegraph wires, or whirring up in great flocks from the stubble, chaffinches chinking from the wayside trees, starlings in clouds, and swallows circling around the church steeples or gliding low over the meadows, just as in the cultivated country behind our own lines on the French side. Even the ugly coal-mining districts had a good quota of birds, but the densest bird population was always where the land was most intensely cultivated.

Later near Brussels we came into a curious country largely under glass, where grapes were the main product; here birds became comparatively scarce again, even the adjacent beech woods had few small birds, but I was delighted to see bird boxes, little sections of hollow branches, nailed to the trees in many places—not near the houses but in out-of-the-way places.

Wild pigeons (*Columba palumba*) swarmed in these woods; all firearms had been confiscated and so the "Chasse du Ramier" had died out, with the result that the pigeons had multiplied without check. Flocks miles in length, resembling the old-time flocks of passenger pigeons, flew over the beech woods to their roosts. But disease, the inevitable result of overcrowding, had made its appearance, and beneath every roost were the remains of hundreds of pigeons, eaten by foxes and hawks, while scores of dying birds moped in the trees or fluttered to the ground. This disease I found to be well known in England—a form of diphtheria.

But this is a digression and has led me away from the point which I wish to make—that absence of enemies will not by itself bring about a large increase of bird life, especially small bird life. Cultivation is the principal factor, coupled with adequate cover; when this cultivation ceases bird life goes.

I would ascribe the large increase of partridges not so much to their comparative immunity from pursuit by man, but to the fact that magpies were practically absent,

and food and cover plentiful. In other parts of northern France, unlike England, the magpie is always present in numbers, his huge nest is always a conspicuous feature in the tree tops along the roads, and partridges have small chance to rear their broods, and if they do, the broods are small.

In the thoroughly devastated region where partridges were so plentiful, magpies had practically disappeared owing to the fact that there were no trees, nor even bushes, for them to build in.

To recapitulate: Leaving the well-cultivated country on the French side of the war zone with its wealth of bird life, one came first to a partly devastated belt about six miles wide where birds became scarce, only a few species like sparrows and starlings persisting in good numbers, feeding around our horse lines; also swallows, fairly numerous, as there were plenty of buildings for them to build in. I will call this six-mile belt A. Next, came a belt ten or twelve miles wide, completely devastated, B. Sparrows, starlings, and swallows had abandoned this region; birds scarcer than in A. Next, was a belt on the enemy's side like A of our side, with similar physical and faunal conditions. Farther eastward stretched a ten-mile belt, not devastated nor destroyed in any way but depopulated, except for soldiers' billets, and uncultivated, with birds as in A, or probably a little scarcer than in the belt A on our side, owing to the fact that there was less waste of horse-feed, also probably because the magpie came into his own again in this belt. Lastly came the well-cultivated country that had not been depopulated, with birds in full strength as under similar conditions on the western side of the war zone.

An impression of Bourlon Wood on the Artois plain during our advance of September 27, 1918. Gray partridges and hares scurried away from the rolling barrage, running panic-stricken between the legs of our advancing infantry. The partridges, thanks to the evacuation of the devastated countryside by their enemy the magpie, grew very numerous, but most other birds left when cultivation was interrupted. Many of the birds, hares, and field mice were killed during the shelling, but always from actual wounds and not from the concussion or from gas.

In a letter to the Editor Mr. Brooks comments regarding the drawing: "This is something out of my line—my first picture of a battle and birds. It makes me laugh every time I look at it, but it is true enough all the same. Don't use it if you have any doubts. I might have drawn a little shrew I saw one particularly hectic day marching down the middle of a *paré* road—midday and bright sunlight—his world was disintegrating"

The New York State Wild Life Memorial to Theodore Roosevelt

By CHARLES C. ADAMS

Director of The Roosevelt Wild Life Forest Experiment Station at the New York State College of Forestry, Syracuse

THE interest of the late Theodore Roosevelt in wild life was not the diversion of a busy man; it was one of his vital needs, for which he found, with all his extensive resources, no substitute. His strong, spontaneous interest in animals was of the kind that comes only from a man with the heart of a naturalist and that cannot be suppressed or pretended.

The naturalist is generally an observer of live animals and of what they do. It was this which appealed to Roosevelt, and it is thus eminently fitting that the new memorial station, established by the legislature of New York in May, 1919, should be called "The Roosevelt Wild Life Forest Experiment Station." That it should be located at the New York State College of Forestry at Syracuse, is appropriate because of what he, with Gifford Pinchot, did for forestry, and, furthermore, because in the future the forests are destined to be one of the main strongholds for the preservation of wild life for a democratic people.

The public is now coming to see as never before the intimate relation between forestry and wild life. Forestry is no longer considered as solely economic in aim. It does not mean merely the growing of timber; it embraces the complete use of woodlands for public welfare, including, in addition to its economic returns from lumber, grazing animals, furs, fish, and game, other uses—educational, recreational, and scientific—which at times may far exceed in social value that of the purely economic.

Roosevelt's Approval of the Plan

It is significant that the present memorial is the direct outgrowth of plans presented to Mr. Roosevelt in December, 1916, for the study of the natural history of forest wild life. He greeted the suggestions with characteristic enthusiasm and urged that they should be taken up "in a big way." In this he clearly indicated one of the essentials of any worthy wild life memorial. The suggested memorial, in this way, comes very near to having his direct approval, and it has met with hearty commendation from Lieutenant Colonel Theodore Roosevelt, who writes: " . . . as you know it was one of the subjects that were always uppermost in my father's mind. I give my consent without reservation for the use of his name for this memorial."

The Roosevelt Wild Life Forest Experiment Station

The duties of the Roosevelt Station are clearly expressed by the New York law as follows: "To establish and conduct an experimental station to be known as 'The Roosevelt Wild Life Forest Experiment Station' in which there shall be maintained records of the results of the experiments and investigations made and research work accomplished; also a library of works, . . . together with means for practical illustration and demonstration, which library shall, at all reasonable hours, be open to the public." Furthermore, the obligations of the station are to make "investigations, experiments, and research in relation to the habits, life histories, methods of propagation, and management of fish, birds, game and food and fur-bearing animals and forest wild life."

Such a memorial station as is contemplated by the law is unique, as no other similar station or institution exists in the United States, although of course, several agencies are devoted to different phases of the problem. It opens up a vast opportunity for the "field naturalist" of the type admired by Roosevelt, and it will serve as a constant beacon of encouragement to young students, and to ecologists whose ardor may have become dampened by too much of the atmosphere of the laboratory or the museum, and to others who need to renew their youthful enthusiasm by realizing that detailed field study on animals is not a temporary, rapidly passing phase of natural history, but a permanent, ever persisting one which will continue to maintain a demand for well-trained field naturalists.

A wild life library of the nature suggested by the law will be equally unusual, as no such special research library along these lines has been assembled in America.

VALUABLE ASSETS OF OUR COUNTRY

Our trout streams and fish ponds afford examples of the kind of problems to be attacked by The Roosevelt Wild Life Forest Experiment Station, for the restocking of habitable waters with game fish involves an extensive study of the habits and needs of the species employed. Roosevelt would have rejoiced in this scientific study of forest natural history; he continually pointed out the ignorance even of zoölogists regarding the ways of the most common wild animals, and his works of travel are filled with observations on life histories. Further, he would have been the first to emphasize the need of undertaking this study in a scientific and systematic way and under the experimental conditions of a laboratory as well as in the out-of-doors

A vast number of books on fish, birds, mammals, game, and other aspects of the natural history of wild life (including many government reports) lie unused, or little used, in innumerable private libraries. These might well be concentrated for the purpose of this station. The scientific publications of the station are intended to cover every phase of the forest wild life problem, and important manuscripts are already on hand.

Investigations at the Roosevelt Wild Life Station

The variety of investigations which may be undertaken appropriately at such a station, is numerous indeed, including the entire gamut of activities of forest wild life. Practical consideration, however, will probably limit the work of the station to a few, relatively, of the more important and urgent lines. As examples of these the following may be given:

Ecology and Life Histories.—The ecology of wild life, or the relation of these creatures to their complete environment, must always remain a fundamental problem in dealing with wild animals. There is urgent need of a great increase in our knowledge of the ecology and life histories of practically all wild life. This is true not only of the larger game and fur-bearing animals, but also of great numbers of birds and fish, even of the common kinds which have long been known. Reflect for a moment upon the great number of men who have devoted a vast amount of time to trout fishing, and it seems almost incredible at first thought that there never has been made an exhaustive, scientific study of a trout stream in America! It is hoped that the trout problem will be made one of the specialties of this station, as it is certainly one of the wild life problems of first importance. The whole subject of the post-hatchery care of fish is another instance of an extensive field in need of systematic study, and furthermore, progress in stocking streams, lakes and ponds must await studies of this character.

The fur-bearing animals of the forest have in the past received but little special study, and their relation to game vermin is another subject demanding detailed attention. The Virginia deer and the beaver are the best known of the larger forest animals, and yet even today we have no thorough study of the influence of a "buck law" experiment, conducted as a scientific problem, and as contrasted with the usual exciting and emotional display which attends the discussion of this subject among sportsmen. In New York State the beaver question is one which will soon demand careful consideration if a sane policy toward these animals is to be maintained. Reliable information, and not general impressions and vague imaginings, is what is needed if wild life is to get a square deal from man.

Physiology and Disease.—There are many problems in connection with the food habits, food, and nutrition of wild life awaiting investigation. Domestic animals have received much attention in this respect, but, as wild life belongs to the public, it has been to a corresponding degree neglected. The control of algæ and other aquatic plants in relation to fish and the pollution of streams is another example of these wild life problems which only a trained physiologist or ecologist can solve. Closely related to the physiological problems are those dealing with the diseases of wild life. These are legion. The diseases of fish have, in particular, been sadly neglected, in spite of the fact that serious outbreaks frequently occur. As a rule the diseases of most kinds of wild life attract but little attention. They are, however, probably important factors in determining the abundance of many of the large game animals. In the case of fur-bearing animals there is a large field for experiments intended to study the effect of food and other influences upon the quality of fur.

Heredity.—The study of heredity in forest wild life opens up a wide subject for experimental research. Disease-resisting strains may prove to be an important means of perpetuating wild life, not only in the case of large game animals, fur-bearing animals, and birds, but in fish and other forms as well. Under proper breeding management wild furs may be greatly improved in both quality and quantity.

Wild Life Policies.—Upon a foundation of fact and inference such as can be built up only by investigations conducted as indicated under the preceding headings, we may hope to build up principles of management or policies for wild life which will fit them into the texture of modern social and economic life. When this is done in a scientific manner, forest wild life will be intelligently and

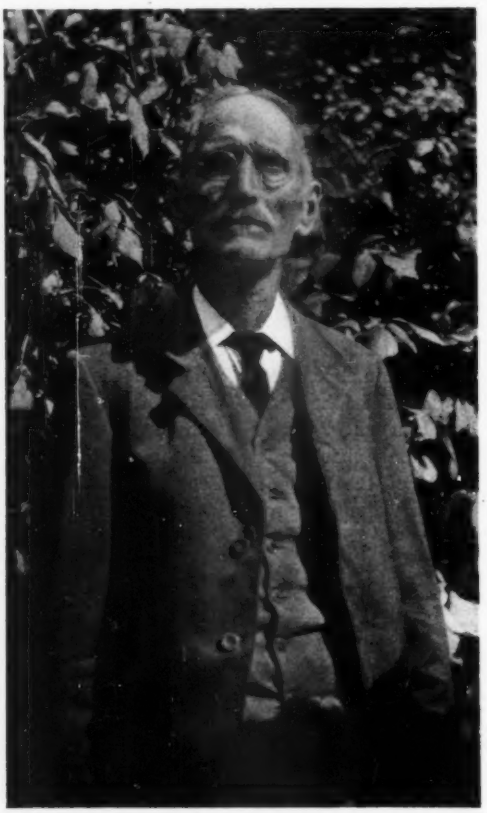
sympathetically appreciated and used by man to the best advantage. To build up these management policies is in fact the largest wild life problem, and the smaller special problems are means toward accomplishing the greater aim. The relation of wild animals to one another and to all the items of their environment is so intricate that those which appear superficially to be wholly unrelated are so entangled that the relation of each can be properly adjusted only by a comprehensive plan which provides for every one in its proper sphere. This plan for adjustment is the most difficult problem of all, which in comparison subordinates all others. It is the capstone or climax of the whole system of use of forest wild life.

Relation of the New to the Old.—The preceding outline is a program for the activities of the new Roosevelt Station. This is in reality a new name for work already under way by the college for the last seven years. For the last five years this work has been conducted on a smaller scale than is contemplated for the new station, but, even with the limited means available in the past, considerable progress has been made. Thus the fish survey of Oneida Lake has made much progress in the study of the food of the fish, the capacity of the waters to produce fish food, in the study of the worm parasites of fish (in coöperation with the United States Bureau of Fisheries), and in the life history and economic relations of the fish of this lake. Extensive reports have been printed on this work. In the Adirondacks, also, investigations have been made of the relation of the summer birds to these forests, preliminary studies have been made of fish, and studies have been started at the timber line on Mount Marcy (made in cooperation with several other scientific institutions). Nor has the southern part of the state been neglected, because in the Hudson Highlands, in the Palisades Interstate Park region, extensive studies have been made (in coöperation with the Commissioners of the Palisades Interstate Park) of the birds and fish, in relation to park campers and visitors. The problem of leech control, and the control of mosquitoes by fish (in cooperation with the United States Bureau of Fisheries), are additional examples of the character of the park problems which are under consideration, and show how these are related to public welfare. It is to the solution of these and similar problems which will arise that the Roosevelt Wild Life Forest Experiment Station is committed by legislative act.

Few types of memorial would have received more hearty appreciation by Roosevelt himself than The Wild Life Forest Experiment Station which has been established recently at The New York State College of Forestry by the New York legislature. The work undertaken by the College and state plans not only service in wild life conservation, but also comprehensive study of habits and life histories, and the practical management from an economic standpoint of the fish, birds, and other game animals of New York. The laboratories for the present are in this building at the College in Syracuse. A special and in many ways unique library devoted to wild life will be collected at the College and maintained there for public use

Samuel Garman, of the Agassiz Museum

SOME naturalists of distinction, perhaps the most fortunate, seem always to ride on the crest of the wave of changing time and circumstance. Today they may be the pivot about which turns awakening popular interest in their chosen subject, tomorrow leaders in the faunal study of some distant clime the treasures of which are becoming available to science, or the exponents of some new point of view by which data, long accumulated, are being arranged in a clearer light. The careers of others follow a direct, unswerving path, building from small beginnings along some definite line where they are presently the recognized authority, and in passing leave a structure which stands for lesser men to build upon until the general level of knowledge rises above its heights and its interest becomes historical.



Samuel Garman, curator of fishes at the Agassiz Museum, Harvard College

Samuel Garman, curator of fishes at the Agassiz Museum of Harvard University, cannot be placed in either of these categories. It would be difficult to think of him as either carried forward by the trend of the times or bending it along the lines of his especial interests. It will never be possible accurately to estimate the sum of his contributions to his chosen science. The writer remembers, when a student in college, carrying to Samuel Garman many subtle problems in differentiating frogs and snakes, and how, although at that time he was doing little work in herpetology, he always with a few words and recourse to a specimen or two within easy reach, not only settled the difficulties, but imparted an appreciation of species characters in the groups which will always be of value. How many others must have received similar aid, for he had then been an active herpetologist and ichthyologist for about thirty years!

While other men gather and discuss the newest discovery, consult distant collections, or plan expeditions, day in and day out one may find Garman in his room in the basement of the Agassiz Museum, working with his specimens and books, independently, for the pure love of it, with infinite care. A chance allusion by Shufeldt, writing in the April-May number of *Natural History*, suggests that Samuel Garman's one-time acquaintances, themselves drifted into new lines, may not always realize that he is still there. His is the especial talent for being always there, where the writer wishes more frequent opportunities these days to take his problems, for the help sure to be received, the equally certain courtesy of welcome, and the inspiration.

A glance at the list of Garman's published works on fishes shows scarcely any acceleration or abatement of effort since the first was issued in 1875. His conclusions have not always been accepted by other workers in systematic ichthyology, but they are invariably interesting and valuable. His most widely known work on fishes is perhaps the description and discussion of a very primitive shark, *Chlamydoselachus*, a number of years ago. It is fortunate that this most interesting fish fell into the hands of so careful and thorough a descriptive naturalist.—J. T. NICHOLS.

Scientific Zoölogical Publications of the American Museum

SUMMARY OF WORK ON FOSSIL MAMMALS

By FRANK E. LUTZ

Editor of the *Bulletin of the American Museum* and Associate Curator in Invertebrate Zoölogy

THE following notices of five of the scientific publications of the American Museum are a continuation of similar notices published in the March, 1919, number of NATURAL HISTORY. Summaries of papers on recent mammals will appear later.

Life Studies Among Fossils

The paper[1] by Messrs. W. K. Gregory and C. L. Camp is one of a series of studies which are intended to clothe the fossil bones of ancient animals with the muscles that once moved them. An earlier contribution by Dr. Gregory and Mr. Erwin S. Christman comprised a restoration of the musculature of lower Tertiary tithanotheres, which will be published in President Osborn's monograph on that extraordinary group of mammals. A second, relating to the jaw muscles of vertebrates, was prepared in the department of vertebrate palæontology of the Museum by Dr. L. A. Adams, and was published during 1918 by the New York Academy of Sciences. Two or more additional papers are now in progress. The specific objects of the studies, as stated by the senior author of the present number, are "to review the homologies of similar muscles in the different vertebrate classes; to make restorations of the musculature of the jaw, limbs, and axial skeleton of certain extinct amphibians, reptiles, and mammals; and to discover, one by one, some of the stages by which the more specialized mechanisms of the higher vertebrates were evolved."

Dr. Gregory and Mr. Camp certainly have given invaluable service to anatomists by placing on record their comparative review of the musculature of the limbs in certain mammals, birds, and reptiles, including such zoölogically important types as monotremes, the ostrich, crocodilians, the tuatara lizard (*Sphenodon*), a birdlike dinosaur, and the terrestrial, carnivorous, mammal-like, Triassic reptile, *Cynognathus*, a complete reconstruction of which is presented in Part V of the paper. The tabulations, which relate to the origins, insertions, and nerve supply of the principal muscles of locomotion, are based not only upon the authors' painstaking laboratory dissections, and a study of the bones of the extinct forms, but also upon the scattered literature in this field, the entire sum of present knowledge of the subject, both original and compiled, being here conveniently brought together within about fifty pages of text and illustrations. Upon these data are based the more general discussions in the paper and the excellent two-color plates which show the probable arrangement and homologies of the muscular system of *Cynognathus*.

As may well be inferred, the paper is of necessity minutely descriptive, and yet illuminating comparison rather than description for its own sake is ever the aim of both authors. By working from the known to the unknown, by ranging the flesh-clad limbs of modern animals side by side with bones which lost their blood and sinew, and even the real bony tissue itself, millions of years ago, Dr. Gregory and Mr. Camp have translated into interesting, even entertaining, language the mechanics of "walking" in its primitive stages, when, although complicated enough, it was far less intricate and specialized than among modern, relatively post-limbed mammals and birds. The differences of posture and movement between upright man and a sprawling reptile or a duck-billed platypus are obvious, but the diverse arrangement and proportions of muscular and skeletal elements, which are substantially the same elements in all three, and the evolutionary relations of the higher type of architecture to the others, are enlightening subjects which the authors of the present paper describe in detail.

In the earliest four-legged animals, as in the fishes, movements of the paired limbs were closely correlated with undulatory movements of the entire trunk and tail, while in

[1] Gregory, W. K., and Camp, C. L. 1918. Studies in Comparative Myology and Osteology. No. III. *Bull. Amer. Mus. Nat. Hist.*, XXXVIII, Art. 15, pp. 447–563, Pls. XXXIX to L. [Review by Robert C. Murphy.]

the highest stages of vertebrate evolution the limb movements and musculature become widely differentiated from those of the axial skeleton. With this progressive adaptation in mind, the authors trace the changes in the bones and muscles of the shoulder and hip girdles, explaining the significance of the expansion of this or that bony part, the development of this or that system of muscles, which, in the long course of evolution, raised the primitive reptile's belly off the ground, enabled the creature to support the entire weight of its hinder parts, for instance, on one hind leg, while it thrust the other forward, and led ultimately to that marvelous, almost inconceivable perfection of balance which permits the highest primate, the lord of creation, to stand and walk and run on two pinlike limbs without even realizing that he is doing anything remarkable.

Space for discussing an eminently successful attempt to describe and historically interpret the structures upon which movement in the higher animals depends is not available, and this notice must close with Dr. Gregory's account of locomotion among primitive vertebrates:

"In reptiles and primitive mammals the fore and hind limbs coöperate with each other in the following way: The fore and hind limbs of the same side move in opposite directions; on the other hand the right fore limb moves in the same direction with the left hind limb and vice versa. The backwardly extended fore foot is raised and moved forward immediately before the forwardly extended hind foot touches the ground. This criss-cross movement of the limbs is correlated with alternate lateral bendings and twistings of the thorax, and with corresponding turning and twisting of the girdles, in such a way that the forward and backward reach of the divergent limbs on one side is increased while the convergent limbs of the opposite are brought still nearer together. Another advantage of this arrangement is that the pull and push of the limb muscles is supplemented by the powerful spiral and spring-like action of the axial musculature, while a third advantage is that by stretching the limbs of the same side in opposite directions the forward thrusts and pulls are brought nearer to the mid-line, and thus the speed is increased. Hence, it should and does follow that the faster a reptile moves the narrower is its trackway."

Studies on the Evolution of Animals of Our West

Dr. W. D. Matthew, curator of vertebrate palæontology in the American Museum, published[1] a continuation of researches on fossils from the Snake Creek beds in Western Nebraska, discovered by the Museum Expedition of 1908 and further explored in 1916. Fossils are very abundant at this locality, but mostly fragmentary, the teeth of three-toed horses being more numerous than anything else; jaws and skulls occur occasionally. There is a great variety of animals, more than sixty species. They belong to the late Miocene or early Pliocene epoch of the Age of Mammals and represent a stage in the evolution of the animals of the western plains which is still very imperfectly known. Various new species and genera of mammals are described, and more complete specimens of others. The most interesting new types described are a large bear-dog, a rodent about the size of a beaver, a peculiar soft-nosed hornless rhinoceros, and a peculiar horned animal supposed to be a ruminant but with a single median horn on the top of the cranium as in the fabled unicorn. An expedition in the summer of 1918, after this article was published, has obtained further interesting collections.

American Museum expeditions in 1909–16 secured large collections of fossil mammals from the Lower Eocene formations of Wyoming and New Mexico, more than all that had previously been obtained, and with the very exact records and careful study of the geology of the strata, it has been possible to clear up the correlation and succession of faunas in a very precise fashion. Many new types have been discovered, and better specimens of others previously known from fragments. The affinities of various genera are discussed, and their bearing on the origin and evolution of the later Tertiary animals. A paper[2] by Dr. W. D. Matthew and Walter Granger takes up the

[1] Matthew, W. D. 1918. Contributions to the Snake Creek Fauna, With Notes upon the Pleistocene of Western Nebraska, American Museum Expedition of 1916. *Bull. Amer. Mus. Nat. Hist.*, XXXVIII, Art. 7, pp. 183–229, Pls. IV–X. [Summary furnished by Dr. Matthew.]

[2] Matthew, W. D., and Granger, Walter. 1918. A Revision of the Lower Eocene Wasatch and Wind River Faunas. *Bull. Amer. Mus. Nat. Hist.*, XXXVIII, Art. 16, pp. 565–657. [Summary furnished by Dr. Matthew.]

primitive insectivora, rodents, and edentates, all of them showing early stages in the evolution of these orders, now widely differentiated but so difficult to distinguish in the Eocene that their true affinities have been a matter of much controversy.

Revision of Ancestral American Horses

The Memoir[1] by Professor Henry Fairfield Osborn, president of the American Museum and honorary curator of vertebrate palæontology, is a very fully illustrated revision of all the described species of ancestral horses from the later Tertiary formations of this continent. The original type descriptions and illustrations are reprinted with carefully revised drawings and redescriptions of each, and of many more perfect specimens referred to one or another of the described forms. The geological correlation is carefully and exactly revised, so that the succession in time is shown as accurately as is possible in the light of all the later researches. Conclusions as to the exact evolutionary succession and phylogeny are mostly postponed until the author's final monograph on the evolution of the horse, but some probable relationships are indicated here and there, and much that will serve as the fundamental evidence for such conclusions.

This volume will be of great aid to all who are interested in the evolutionary history of the horse, as it brings together a vast mass of data and evidence hitherto scattered through a great number of miscellaneous publications, and corrects many errors or inaccuracies of the older descriptions and illustrations; and more than all because it describes for the first time a large part of the fine collections of Tertiary Equidæ secured by various American Museum expeditions.

Exploration of the Cave Deposits of Porto Rico

A Memoir[2] by Mr. H. E. Anthony, associate curator in mammalogy in the American Museum, is of unusual interest because of its bearing upon the geological history of the West Indies. Whether these islands are the remnants of a former Antillean continent, or have always been islands since they first rose from the sea, whether they were formerly connected with North or with South America, or, as some have thought, with Europe or Africa, are problems which have been much discussed by geologists and zoölogists. Almost nothing had been known of the extinct animals of the West Indies, which might afford valuable evidence on such problems. A few years ago important discoveries of fossil animals were made in Cuba by Dr. Carlos de la Torre, professor of biology, zoölogy, and zoögraphy in the University of Havana, and in Porto Rico by Dr. Franz Boas. Mr. Barnum Brown, cooperating with Dr. de la Torre and other friends of the Museum, has followed up the earlier Cuban discoveries with great success. Mr. Anthony undertook a systematic exploration of the cave deposits of Porto Rico and other West Indian islands with equally satisfactory results. Valuable evidence has also been obtained by explorations for the National Museum and the Museum of Comparative Zoölogy.

In this Memoir Mr. Anthony describes and illustrates the fossil mammals obtained through his expeditions in Porto Rico. They consist of a remarkable new insectivore, a small ground sloth, a number of rodents large and small, and a few bats. Except for the bats, the fossils are all new and rather distantly related to any continental mammals, the nearest affinities being with South America; but they are quite closely related to the fossil mammals found in Cuba and Hayti. This would seem to show that the larger islands have been united at no very remote date, geologically speaking, and that they have not been united to either continent since the Miocene or Pliocene, if at all. The evidence is wholly against any former union with Europe or Africa. Mr. Anthony is disposed to believe in a union with South or Central America in the Miocene, as against the alternative theory that these mammals are descended from a few stray waifs drifted across by seas and currents on "natural rafts" from the South American rivers.

[1] Osborn, Henry Fairfield, 1918. Equidæ of the Oligocene, Miocene, and Pliocene of North America, Iconographic Type Revision. *Memoirs Amer. Mus. Nat. Hist.*, II, N. S., Part 1, pp. 1–330, Pls. I to LIV and 173 text figures. [Review furnished by Dr. Matthew.]

[2] Anthony, H. E. 1918. The Indigenous Land Mammals of Porto Rico, Living and Extinct. *Memoirs Amer. Mus. Nat. Hist.*, II, N. S., Part 3, pp. 331–435, Pls. LV–LXXIV and 55 text figures. [Review furnished by Dr. Matthew.]

White pelicans and other bird inhabitants of the Klamath Lake Reservation on the Oregon-California boundary, as shown in the bird habitat group at the American Museum

Region too Alkaline for Crops

Soil expert of the United States Department of Agriculture pronounces lands about the Malheur Lake and Klamath Lake Bird Reservations in Oregon and Northern California too alkaline for growing crops

By E. W. NELSON

Chief, Bureau of Biological Survey, United States Department of Agriculture

DURING the last few years conditions have arisen in Oregon and northern California which have become increasingly threatening to the existence of the Malheur Lake and Klamath Lake Bird reservations. These are perhaps the most notable migratory-bird reservations in the United States. Malheur Lake is situated in eastern Oregon, a part of the arid Great Basin; the Klamath Lake Reservation is located partly in Oregon and partly in the adjacent part of northern California. Both contain a great area of swampy land with a shallow-water lake in the middle, thus forming ideal homes for enormous numbers of migratory wild fowl, including myriads of ducks, geese, and pelicans, during the nesting season as well as during the spring and fall migrations.

In a region where marshy or swampy areas are as scarce as they are in the northwestern states such areas become of the highest importance in connection with the conservation of our wild bird life. In their prime these two reservations were perhaps the finest and most populous of any federal bird preserves in the United States. With the growth of settlement in the West land promoters have found opportunity to ply their calling in the districts about both of these reservations and have made continued efforts to secure the abolition of the reservations in order that the lands might be utilized for other purposes.

The marshy lands about the borders of the lakes which form the center of both of these reservations produce an abundant growth of tules, rushes, and other grassy growth which has a certain value as forage for live stock. Owing to the alkaline character of the lands within both of these reservations, the United States Biological Survey has for a long time been convinced that they would be of no value for culti-

vated crops and that their present production of forage furnished their sole agricultural value.

During the summer of 1919, in order to get definite information as to the facts concerning the value of these lands for agricultural purposes, one of the most experienced and competent of the soil experts of the Department of Agriculture made a reconnaissance of the lands in both Malheur Lake and Klamath Lake reservations. In the report of his reconnaissance the soil expert states definitely that he considers the percentage of alkali in these lands so high that they are valueless for the purpose of growing crops, and that if the water were drained from the lakes the marshes and lake bottoms would become alkali flats.

Malheur Lake is maintained by water which is drained into it by the Blitzen and Silvies rivers. The broad belt of marshy lands surrounding Malheur Lake, covering thousands of acres, produces forage enough to support numerous settlers with their live stock. It is now proposed to divert the water of these streams high up in their courses for purposes of irrigating other lands. If this plan is carried out it means inevitably that Malheur Lake will become dry and the stock ranches which are now scattered around the lake will be rendered perpetually worthless. Thus a large number of the earliest settlers in that region will be deprived of their homes and property, to a value possibly approaching $1,000,000.

So much for the destruction of the property involved in case the present plans are carried out, but further than this will be the great loss to the state in depriving it of one of the most notable wild-fowl resorts in this country, where enormous numbers of ducks and geese and other birds have reared their young from remote times. The loss of this reservation will be irreparable since there is nothing to replace it in that region. Similar consequences will result from the drainage of the Klamath Lake Reservation with the idea of making it into farms.

There is now a bill in Congress for the taking over of the Klamath lands for the purpose of their being opened to settlement, especially for the benefit of soldiers of the late war. In view of the recent survey of these lands by the soil expert and the determination that they are too alkaline for crop cultivation it appears as though any soldiers who are led to locate there with the idea of building up homes will have no reason to thank those who led them into such locations.

In view of the practical worthlessness of the lands in the Malheur Lake and Klamath Lake reservations for cultivation and the exceeding value of these areas for wild fowl, it is to be hoped that they may be continued as bird reservations and the people living about them under present conditions may thus be enabled to retain their homes. If this is done these reservations will serve as important supply points for providing migratory wild fowl for other parts of the country. Such locations are becoming so few that the loss of each one now becomes irreparable. This is especially true of such large and notable areas as Malheur and Klamath lakes.

Biological Surveys of States

By the United States Department of Agriculture during 1919

WORK in biological investigations of birds and mammals by the Bureau of Biological Survey, United States Department of Agriculture, and cooperating institutions, while somewhat interrupted by the war, is rapidly getting back to normal.

In Wisconsin the State Geological and Natural History Survey is coöperating with the United States Department of Agriculture in the work, which is in charge of Dr. Hartley H. T. Jackson for the Department of Agriculture, and Professor George Wagner, of the University of Wisconsin, for the state of Wisconsin. Work was begun May 15 and continued until September 20. The principal field of coöperation was the northwestern part of the state, special attention being devoted to the Apostle Islands in Lake Superior. Mr. Harry H. Sheldon for the Biological Survey, and Mr. Arthur J. Poole for the Wisconsin Survey, assisted.

In Montana, Mr. Marcus A. Hanna, assisted by Mr. Harry Malleis, worked the

valley of the Missouri and the bordering plains and mountains from the mouth of Milk River westward, under the general direction of Mr. Edward A. Preble. The Little Rockies, Moccasin Mountains, Big and Little Belt Mountains and Castle Mountains were visited during the latter part of the summer. Mr. Victor N. Householder was a member of the party during the early part of the season.

The biological survey of Florida was continued by Mr. Arthur H. Howell. Field studies were carried on during March and April over a large part of Lee County and in the region around Lake Okeechobee. The collections in the Florida State Museum were examined and the specimens carefully identified. A collection of bird records from Florida, both published and unpublished, shows approximately 390 species and subspecies recorded from the state.

Coöperating at different times with the Biological Survey in field work in the state of Washington were the following: Prof. William T. Shaw, State College of Washington, Pullman; Prof. H. S. Brode, Whitman College, Walla Walla; Prof. J. W. Hungate, State Normal School, Cheney; Prof. J. B. Flett, National Park Service, Longmire; Mr. William L. Finley and Mrs. Finley, Portland, Oregon; and Stanton Warburton, Jr., of Tacoma. The Biological Survey was represented for a part of the time by Mr. Stanley G. Jewett, Pendleton, Oregon; and throughout the season by Mr. George G. Cantwell, Puyallup, Washington, and Dr. Walter P. Taylor, of the Biological Survey, the last named in charge of the work. Investigations were made in the Blue Mountains area of extreme southeastern Washington, in which occurs an unusual mixture of Rocky Mountain and Cascade Mountain types; and in Mount Rainier National Park, in connection with which the circuit of Mount Rainier was made for the first time, so far as known, by any vertebrate zoölogical expedition.

In North Dakota Mr. Vernon Bailey worked through September and October to get data on the hibernation of mammals and on the stores of food laid up for winter by nonhibernating species. He has returned with many valuable notes to be added to his report on the mammals of the state, and with an interesting collection of live rodents for study of habits in captivity.

Latest Conservation News from Pacific Coast[1]

IN northeastern California Burney Falls, tributary to the Pitt River, with the surrounding 160 acres of forest, have been donated to the state by the owners.

Tumalo Cañon, near Bend, Oregon, with alternate rock-walled gorge and forest- and flower-decked bottom land, has been set aside for the people. This is through the generosity of the Shelvin-Hixon Lumber Company, which gives the cañon, and with it a strip of timber along the highway, as a memorial to the late Thomas Shelvin. The company did not own some of the most beautiful parts and bought them at a cost of $20,000 to include them in the gift. This bit of protected highway will be in striking contrast with the road leading into Bend, which for many miles is a desolation of burned and cut-over yellow pine.

From Washington comes news of the organization of a league called the "National Parks Association of Washington," with Major Everett G. Griggs, of Seattle, chairman. In a small folder the league announces its purpose—which is worthy the attention of the citizens of every state in the Union:

"To preserve the natural features of our state as a part of our inheritance, and to retain in their present beauty our mountains, lakes, trails, and points of scenic interest; to advocate new national parks and the creation of state, county, and municipal parks and highways to connect the same; to preserve our lakes, rivers, and streams from pollution, and conserve our natural supply of food and game fishes; to protect our wild animal life from extermination; to encourage love of nature; and to preserve in the virginal state some part of our great forests."

Washington and Oregon have no great forests of redwoods, but they have mighty forests of other conifers only less majestic. For the sake of the water supply these forests should no longer be cut on the slopes and peaks of the Cascade Mountains and along streams and around the borders of lakes; and for the sake of the beauty of the

[1] Through the courtesy of Mr. Madison Grant, who served as organizer for the Save the Redwoods League, we are enabled to publish these results of activity and influence of the Save the Redwoods League, the National Park Service, the United States Forest Service, and local western conservationists.

highway and the comfort of the traveler who follows it, the forests should be protected along both sides of the road. Preservation of scenic beauty in Oregon and Washington without doubt will be handicapped. The region is sparsely settled and the pioneer idea of destruction still predominates. One immediate point of contest lies in this work on the highways. If, however, a right of way from 300 to 1000 yards wide be purchased, there will result some of the most beautiful drives in the world.

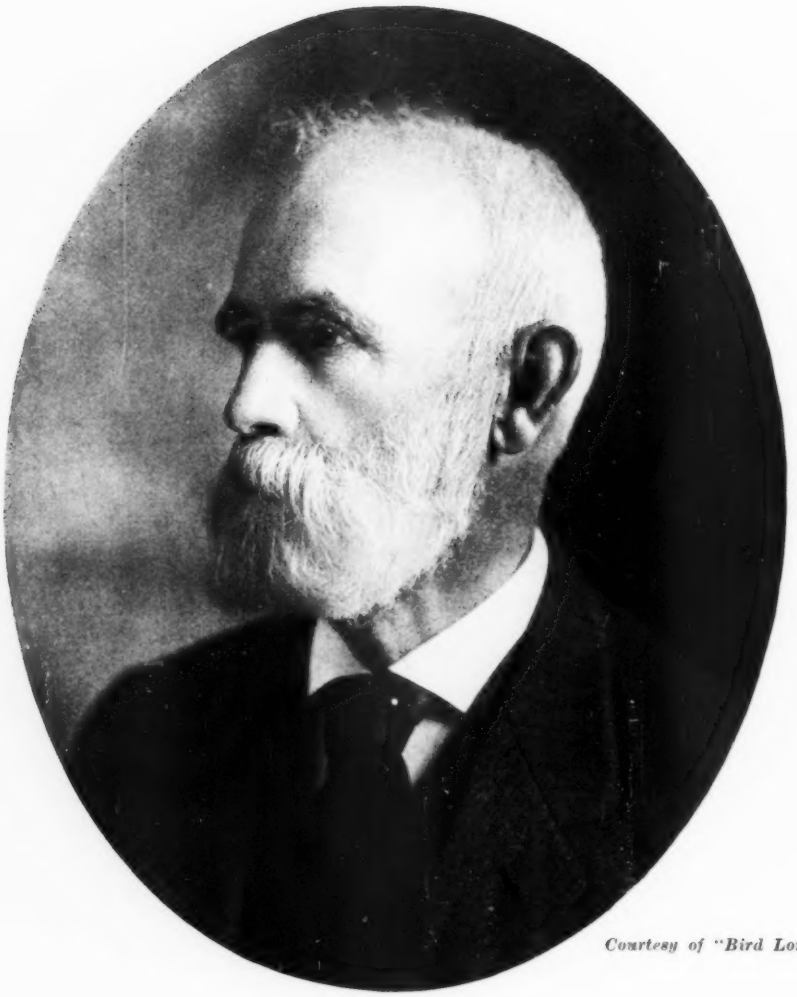
In addition to the need of attention to the highway problem and to the northern redwood problem, there are other conservation matters along the Pacific Coast that should have the light of publicity thrown on them. Among these is the needed rescue from real estate development of the Seventeen-Mile Drive and its unique cypress forests, near Monterey, California.

A vast satisfaction must be felt by the man who has accomplished a national good, or helped in accomplishing it. To do something for others is the great joy-giving requirement of the human mind, and to be able to give largely, where it will bring good to many thousands, hundreds of thousands, or even millions of fellow Americans—that must bring a broadening of vision great to the extent of dwarfing most of the really insignificant things of life.

An example of such giving was set in 1908. Mr. William Kent bought the redwoods on Mount Tamalpais overlooking Golden Gate and the waters of the Pacific, the last of the redwood race in all that bay region of California. Then he sent a deed of gift to the National Government. Also he requested that the monument be named the "Muir Woods," for his friend John Muir, even after Roosevelt wrote from the White House that he would greatly like to name it the "Kent Monument."

Mr. Kent characterized these redwoods, standing strong and self-reliant, shelter for the hosts of ferns and flowers of the ground, as signifying the chivalry of the forest and suggesting the ideal of individual and social life in America: "Stand straight and strong, who can; protect and shelter the weak." The characterization has even broader application in 1920 than this national meaning he gave it in 1908. And for one thing, surely, it sets the way, for those of us who can give, to make the United States, both East and West, the kind of country in scenic beauty and recreational opportunity which will best serve all the people.

"Stand straight and strong, who can; protect and shelter the weak"



Courtesy of "Bird Lore"

William Brewster—In Memoriam

By FRANK M. CHAPMAN

WILLIAM BREWSTER died at his home in Cambridge, Massachusetts, on July 11, 1919, six days after the completion of his sixty-eighth year. For nearly half a century he has been in the front rank of American ornithologists. He was the moving spirit in the organization of the Nuttall Ornithological Club of Cambridge, which, formed in 1873, was the first society of its kind in this country, and much of the success of this club during the succeeding forty-six years was due to his unfailing support.

From the Nuttall Ornithological Club there developed the American Ornithologists' Union, a body which has exercised a profound influence upon the study of birds in this country, and in the formation of this society Brewster also played a part of first importance. He served as president of the Union from 1896 to 1898, and, from its organization in 1883 until his

death, he was an active member of its Council.

Mr. Brewster was also one of the Founders of the original Audubon Society which grew from the American Ornithologists' Union; he was for years a director of the National Association of Audubon Societies, and president of the Massachusetts Audubon Society.

From 1880 to 1887, Brewster was assistant in charge of birds and mammals in the Boston Society of Natural History; from 1885 to 1900 he held a similar position in the Cambridge Museum of Comparative Zoölogy, and from the last-named date to the end of his life he was, in effect, honorary or advisory curator of birds of that institution. His active curatorial duties, however, were connected with the development of his private museum. This, a fire-proof, brick structure, perfect in all its appointments, was erected on the grounds of his Cambridge home. It contained his library and collection of North American birds. The latter, by the terms of Mr. Brewster's will, has been given to the Museum of Comparative Zoölogy to which he also left the sum of $60,000.

William Brewster occupied a unique position in American ornithology. Well grounded in the fundamentals of the science, the peer of any of his colleagues in technical research, conservative in statement, as accurate in the presentation of facts as it is humanly possible to be, he still never let his interest in the science of ornithology absorb or diminish his love for the sentiment of ornithology. It was the bird in the bush rather than the bird in the hand which commanded his attention, and his more important contributions to ornithology consist of the results of his study of birds in nature. These were made with a born naturalist's enthusiasm and sympathetic insight, and with a trained observer's discrimination, while their results were presented in a literary form which has rarely been approached in the annals of ornithology.

The achievements of a scientist are not to be measured alone by his published works, but also by the influence he exerts upon his time. Viewed from this standpoint, William Brewster occupied an enviable position among ornithologists. Possessed of an exceptionally attractive personality, sincere, unselfish, considerate of others, of sound judgment, he won the esteem, respect, and confidence of everyone who knew him. It was therefore not alone his knowledge of birds, but also the nobility of his character which made William Brewster a potent factor in the development of the science of ornithology in this country.

Forest Conservation in New York State

Extracts from statement by the State of New York Conservation Commission

THE area of the New York Forest Preserve at the close of 1919 is 1,886,550.81 acres. The acquisition of additions to the Preserve during 1919, has been carried out with funds provided by a bond issue authorized by the voters in 1916. The work of acquisition is now carried on under a carefully developed plan, which permits it to proceed systematically and with complete assurance that the state will receive full value for every dollar expended.

In order that a purchase price may be agreed upon with the owner, all large tracts offered are thoroughly cruised by foresters of the Commission, who determine the quantity of timber on the property. The work that the foresters do is entirely in the nature of a topographical and quantity survey. They are then followed by appraisers, who ascertain the value of the timber in the place where it stands. It frequently happens that the owner of the property also makes a valuation survey, and in case of dispute, the Commission in some instances has the land cruised a second time by different parties, as a check upon the work of the first.

During the past year the land examined by foresters and appraisers, some of which had been offered in 1918, included 67,295 acres in the Adirondacks and 17,029 acres in the Catskills, a total of 84,324 acres; and of these amounts the Commission has negotiated the purchase of 42,371.98 acres in the Adiron-

dacks and 16,415.30 acres in the Catskills, a total of 58,787.28 acres. The average price agreed upon for the Adirondack land was $14.90 per acre, while the average price of that in the Catskills was $6.26 per acre. The purchases made during the year amounted to $734,059.51. In addition there have been appropriated 92,810.89 acres in the Adirondacks and 1740 acres in the Catskills. All of these acquisitions have been approved by the Commissioners of the Land Office, although some of them must still be approved by the Attorney General and other steps taken before the purchases will be completed and the titles vested in the state.

The first effort of the Commission is to acquire land that lies on the high mountain slopes, where the danger of denudation following lumbering and forest fires is the greatest. These are the sections that should be forever maintained as protection areas, and upon which no lumbering should ever be permitted. When the region was formerly lumbered, the forests on these upper slopes were left untouched because the low price of timber and pulp wood at that time made it unprofitable to operate in those more inaccessible locations. Now, however, the price of lumber and pulp wood is much higher and the timber on a portion of these high, steep slopes could be removed for manufacturing purposes. These facts account for the relatively high price of certain of the lands acquired.

The Shore Owners Association of Lake Placid in 1918 raised a fund of $30,000 as a gift to the state to pay part of the purchase price of land lying on the slopes of McKenzie and Saddleback mountains, in order that these slopes might be immediately acquired for the purpose of stopping denudation. Since that time, public-spirited citizens interested in the welfare of the Adirondacks have organized the Victory Mountain Park Association, for the purpose of collecting funds to assist in the acquisition of portions of Mt. Marcy and the forest surrounding it, as a memorial to the soldiers and sailors who lost their lives during the war. This fund is being raised by popular subscription in amounts ranging from one dollar up, and it will eventually be turned over as a gift to the state. Meanwhile, however, to check the lumbering that had already started on the mountain, the Commissioners of the Land Office, acting upon the recommendation of the Conservation Commission, have authorized the appropriation of all of the tract that is now threatened with denudation.

Lands already acquired during the year, or the acquisition of which has been authorized by the Commissioners of the Land Office, include all or parts of the upper slopes of Mounts McKenzie, Saddleback, Whiteface, McIntyre, Marcy, Skylight, Redfield, Allen, McComb, Seward, Seymour, Esther, Sawtooth, Colden, Cliff, and Wallface. While some of these lands have cost a comparatively large amount owing to the fact that they contain large virgin growths of softwood, nevertheless they are the forests of greatest value to the people of the state of New York as protection forests for the sources of some of the largest rivers, and as vacation grounds, including within their boundaries the most beautiful and impressive scenery of the Empire State.

English Sparrows live below Sea Level

THE apparent ubiquity of the common English sparrow frequently causes us to forget that this bird is not indigenous to this continent and that its advent in some parts is relatively recent. Dr. Joseph Grinnell, director of the Museum of Comparative Zoölogy of the University of California, has discovered a new "outpost" of sparrows in the heart of Death Valley, California, at Greenland Ranch, 178 feet below sea level. Sparrows, which were introduced into New York City sometime between 1860 and 1864, arrived in California in 1871 or 1872, but they required nearly forty-two years more to extend to San Diego in the southern part of the state. This Death Valley location, however, involving the greatest extreme of temperature with low relative humidity in the country (134 degrees Fahrenheit on July 10, 1913), presents a novel problem of adaptation. It will be interesting to watch the subsequent development of this bird colony under these extreme climatic conditions which formulate a natural experiment that may throw some light on the question of the development of subspecific characters.

Honor to Adam Hermann

Address on the occasion of his retirement after nearly thirty years of service as head preparator of fossil vertebrates at the American Museum

TO Adam Hermann, his friends and fellow workers present their congratulations upon his record of high achievement. For nearly thirty years a leader in the preparation and mounting of fossil skeletons, his skill, ingenuity, and inventiveness have revolutionized the technique of his chosen profession and aided greatly in the progress of science.

In his early days at Yale University he was trained under the vigilant eye of Professor Marsh to an exact and scrupulous regard for finish and accuracy of detail, and the perfect preservation and safety of specimens and records. Coming to the American Museum in 1892, he found an opportunity for broader and more progressive work, retaining the high standards of his early training, but adapting them to new methods of preparation and exhibition which combined strict scientific accuracy with the largest possible utility in popular education.

When Mr. Hermann came to the Museum the department of vertebrate palæontology was in its infancy. A beginning had been made in the field expeditions and some valuable collections stood ready to his hand. But little or nothing had been done toward preparation and exhibition. During the twenty-seven years that have passed since that time, he has seen the exhibits, beginning with a little group of specimens that stood in the corridor next the elevator, grow steadily year by year. They expanded first into the hall of fossil mammals, then overflowing these limits, filled the great dinosaur hall, and finally, a third and still larger hall has been required to contain the great and ever increasing series of fossil skeletons, and a fourth hall is urgently needed. Step by step with the expansion of the exhibits their fame and reputation have grown steadily both at home and abroad, so that the people of the city are justly proud of their great Natural History Museum and of its wonderful skeletons of extinct animals.

His methods of preparation and mounting have been very generally adopted for similar work in other museums, often by preparators trained in this Museum under Mr. Hermann's direction. Gidley and Horn in Washington, Peterson and Coggeshall in Pittsburgh, Miller in Chicago, Martin in Lawrence, George Sternberg in Ottawa, all received their training here, while many scientists and museum men in this country and in Europe have come to the American Museum to learn the best methods of preparing and exhibiting fossil vertebrates.

Mr. Adam Hermann, head preparator in vertebrate palæontology at the American Museum, who has just retired

The first skeleton which Hermann mounted for this Museum was the *Cænopus tridactylus*, a fine example of the panel or low relief mount, which has been so largely used in our later work. Next came the *Metamynodon*, the first of our open or full relief mounts, the first attempt, I think, to mount a Tertiary mammal in this style. Then came the great *Brontops* skeleton, which has been the pride of our Tertiary mammal hall for twenty-four years, and will, we hope, remain standing in broad and sturdy massiveness, defiant of all rivals, for many a year to come. The acquisition of the Cope mammal collection in 1893 provided a new series of valuable and classic specimens, and as the expeditions brought in new material year by year and the labora-

tory staff enlarged, the exhibits grew more and more rapidly. The famous *Phenacodus* skeleton afforded an opportunity for what was then thought a remarkable *tour de force:* to make an open mount in which every bone of the skeleton could be conveniently removed if desired for separate study. Today this method has been very widely applied, and it is customary to arrange any rare or unique skeleton so that the parts can be readily dismantled for study.

In 1897 the department entered a new field, extending its work to the dinosaurs and other fossil reptiles. This brought up new problems for solution. The gigantic size and fragile character of the skeletons of the dinosaurs made them far more difficult to restore and mount than anything that had previously been attempted. The first work done on the dinosaurs was of the nature of preliminary experiments; first, in mounting the limbs, then, in devising mounts that would hold securely the individual vertebræ; finally, in restoring and mounting the entire skeleton of a *Brontosaurus.* These various experiments, along with studies in pose and musculature, took time, so that it was not until 1905 that we were able to exhibit the completed *Brontosaurus* skeleton. Meantime our friends in Pittsburgh had studied and profited by our experiments and were able to complete their *Diplodocus* mount a little before the *Brontosaurus* was ready for exhibition. It is but fair, however, to say that the chief credit for devising methods to mount the skeletons of the giant Sauropoda belongs to Adam Hermann.

Another very different problem was presented by the great marine reptiles and fishes of the Kansas Cretaceous. The skeleton of *Tylosaurus dyspelor* was one of the first and is still the finest mounted skeleton of a Mosasaur on exhibition. The method of mounting this specimen included ingenious devices for reducing the weight of the great block, 26×6 feet, and for strengthening it and securing its permanency.

The later history of the laboratory has been one of continued progress and prosperity. Always ready to experiment with new devices, new tools, new cements or preservatives, many improvements have been introduced, others tried and abandoned. Gum arabic replaced glue, and to a large extent shellac[1] has replaced gum arabic. New cements of various kinds have been tried out. Electric power has been applied to various operations. The numerous and conspicuous mountings of the early skeletons have been reduced to a few inconspicuous simple lines.

The laboratory methods and technique have always been fully and freely explained and displayed to all who were interested. No petty rivalries or secrecy for the supposed selfish advantage of this institution has been allowed to interfere with the progress of the science. A spirit of friendly cooperation has become more and more prevalent and has aided no less than ingenuity or inventiveness in placing our American Museum laboratory technique in its present position of acknowledged leadership. In furtherance of this spirit of mutual helpfulness Mr. Hermann prepared and published in 1909 a fully illustrated description of his methods and technique which has served as a textbook in laboratories of vertebrate palæontology and has been of great help to preparators both in this country and abroad. While credit for the initiation of this liberal policy is due to Professor Osborn, yet to Mr. Hermann, as to other department leaders, belongs the credit of carrying it out loyally and effectively.

In a recent census of the fossil skeletons it appeared that no fewer than one hundred were at that time mounted on exhibition, ranging from the giant *Brontosaurus* to the tiny *Pterodactylus.* Most of these skeletons have been prepared and mounted in our laboratory, the greater number either by Mr. Hermann himself or under his direction. This is a record which it is safe to say is not equaled nor is likely to be by any other preparator of fossil vertebrates.

And, last but not least, we who have worked with Adam Hermann for so many years cannot fail to express our appreciation of his loyalty to the American Museum and to the department of vertebrate palæontology, his watchful care over the expenditure of both time and money in the prosecution of our work, the aid and instruction freely given to his subordinates, his frank appreciation of good work, and criticism of all that failed to reach the Museum's standards. To this spirit of loyalty and friendly cooperation, not less than to diligence and skill, we ascribe the growth of the department from its small beginnings in 1892 to its present position.—W. D. MATTHEW.

[1] First used in this laboratory in 1901, I think.

Mona Island Declared a Forest Reserve

IN connection with Dr. Lobeck's mention of Mona Island in his article on the physiography of Porto Rico (page 523), American naturalists will be grateful to know that Mr. E. M. Bruner, forester of Porto Rico, has taken the steps to have Mona declared a forest reserve, and that his efforts have been rewarded with success. On December 22, 1919, Mona Island and Monito (an islet three and one half miles northwest of Mona) were declared an Insular Forest by proclamation of the governor. This insures the preservation of the highly interesting natural conditions, especially by preventing the indiscriminate cutting of the scanty timber for charcoal.

Mona Island is situated in Mona Passage, halfway between Porto Rico and Santo Domingo. It consists of a nearly flat tableland of limestone averaging about two hundred feet in height, with a sheer sea cliff on the north and east, where it is subject to the most continuous wave action, and a terrace of flat sandy soil at the base of the scarcely less precipitous cliff on the south. Partly successful attempts to grow corn and cotton are being made on this terrace, and coconuts and bananas grow along the base of the cliff where the soil is moister and where there is an occasional spring.

The very unusual native vegetation of the table-land is practically untouched, however, and in its adaptation to extremes of aridity and sterility presents habitat conditions which can scarcely be duplicated in either Porto Rico or Santo Domingo.

Most interesting of the animals on Mona is the large rock iguana (*Cyclura stejnegeri*), which, it is to be hoped, will continue to exist there now that its habitat will be preserved. The inaccessibility of the island affords it the necessary protection from man, its only other enemies being the dogs which are used to hunt the wild goats, pigs, and cattle. The rock iguanas are extinct in Porto Rico, although their bones are found in caves, and the related species in Santo Domingo appears to be on the verge of extinction also.—K. P. SCHMIDT.

Destruction of Yellowstone Park Elk

THE Yellowstone Park herd of elk has been driven from the park ranges this winter by the unusually severe snow storms and as a consequence from 6000 to 7000 head have been slaughtered by hunters in the state of Montana. A *News Bulletin* from the National Parks Association tells of this wild-life disaster which for pure blood lust recalls the last days of the buffalo.

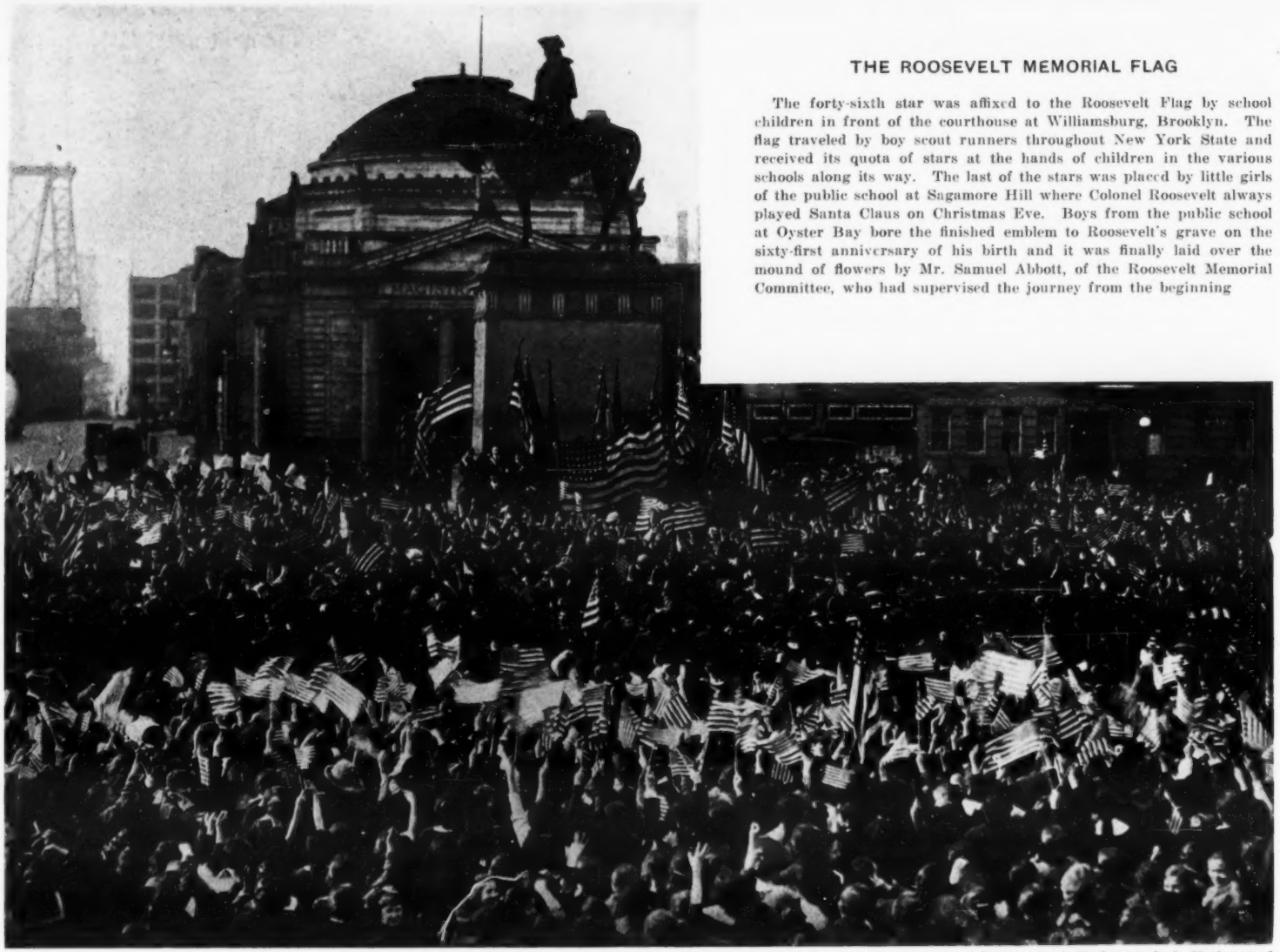
This Yellowstone Park herd of about 30,000 elk is a genuine remnant of the wild life of former days and not a product of stocking the Park, but in its present restricted range it usually requires some assistance through at least a part of the winter.

The animals have become almost fearless of men because of their long residence in the sanctuary of a national park, and consequently the herd could easily be approached. Hunters killed them in many instances by firing volleys into the bands and shipped out carcasses by the carload. The state of Wyoming has established game preserves along the park boundary to protect the elk, but Montana has not only refused to act likewise but has even this year extended the open season from October 15 to December 24. Those animals which escaped the hunters now face starvation on the snow-covered grazing grounds.

The southern herd has been saved with funds provided through the activity of Dr. E. W. Nelson, chief of the Biological Survey, but, even with the diversion of next spring's road improvement money for additional hay, sufficient forage cannot be procured. Congress has been asked for an appropriation but in the present crises of national and international affairs action is likely to be slow. Meantime the National Parks Association is receiving contributions for a fund for the rescue of the elk. It is also preparing to bring pressure to bear on the legislature of Montana, in order in the future to protect the southern herd along the park boundary, and to permit it to recuperate.

THE ROOSEVELT MEMORIAL FLAG

The forty-sixth star was affixed to the Roosevelt Flag by school children in front of the courthouse at Williamsburg, Brooklyn. The flag traveled by boy scout runners throughout New York State and received its quota of stars at the hands of children in the various schools along its way. The last of the stars was placed by little girls of the public school at Sagamore Hill where Colonel Roosevelt always played Santa Claus on Christmas Eve. Boys from the public school at Oyster Bay bore the finished emblem to Roosevelt's grave on the sixty-first anniversary of his birth and it was finally laid over the mound of flowers by Mr. Samuel Abbott, of the Roosevelt Memorial Committee, who had supervised the journey from the beginning



Courtesy of Underwood & Underwood

Notes

NATURAL HISTORY greatly regrets that owing to the printers' strike in New York City no numbers of the magazine were issued during October, November, and December. The present number, dated December, covers these issues and closes the publication of the 1919 volume. Also, it is regretted that, because of the extraordinary present cost of material and labor, a change of policy is necessary in the issuance of NATURAL HISTORY. Announcement has already been made to readers of the magazine that during 1920 it will be issued as a bimonthly, in six numbers (instead of eight as heretofore), appearing about the first of February, April, June, August, October, and December. It is hoped that by this plan the same standard of quality can be maintained notwithstanding the increased cost of production.

A LEAGUE of the Red Cross societies of Great Britain, the United States, France, Italy, and Japan has been founded with headquarters in Geneva. This new Red Cross organization plans to function as an agency for relieving national and international disasters. It has also projected the formation of an international bureau for coördinating sanitation and knowledge of sanitation and the prevention of disease throughout the world. In this capacity it has already been called upon for help by the Supreme Economic Council in Paris. Lieutenant General Sir David Henderson, K. C. B., is director general of the league, and Henry P. Davison, a trustee and treasurer of the American Museum of Natural History and formerly chairman of the War Council of the American Red Cross, is chairman of the board of governors. Dr. Richard P. Strong, professor of tropical medicine at Harvard University, has charge of the medical and public health activities of the league.

SIR WILLIAM OSLER, regius professor of medicine at Oxford University, died on December 29 in his seventy-first year. But a few months previously on the occasion of his seventieth birthday, two volumes of medical essays, contributed by distinguished British and American colleagues and former colleagues, were presented to Sir William. The presentation was made at the Royal Society of Medicine (London). Sir William was a Canadian by birth and held his first professorship at McGill University, but, as he remarked, the list of contributors to the volumes in his honor recalls a "vagrant career. . . . Toronto, Montreal, London, Berlin, and Vienna as a student; Montreal, Philadelphia, Baltimore, and Oxford as a teacher." He was honorary professor of medicine at Johns Hopkins University at the time of his death.

DR. ABRAHAM JACOBI, physician and teacher, died on July 10, 1919. He came to this country from Germany in 1853, after having suffered imprisonment from the Prussian government as a result of his participation in the Revolution of 1848. In New York he started a modest practice and in 1857 began lecturing in the College of Physicians and Surgeons on the diseases of children. Later he taught in Bellevue Hospital College and the University of New York and became clinical professor of pediatrics in Columbia University in 1870, retiring as professor emeritus in 1899 after nearly half a century of instructional work. His contribution to the literature of children's diseases was large and includes a number of very important treatises.

ONE of the most conspicuous phases of recent work of the Rockefeller Foundation, which was established in 1913 "to promote the well-being of mankind throughout the world," has been an educational and medical campaign against tuberculosis in France. By spectacular methods of advertising, the propaganda was carried far and wide over the country and many dispensaries and laboratories were established. In the United States the Foundation has demonstrated in two states that it is possible and profitable to get rid of malaria, either by destroying the malarial mosquitoes or, where this is impossible, by curing the human "carriers" of the disease. In the case of yellow fever, an attack has been made against the strongholds of the disease in Guatemala, and an expedition was sent to Ecuador for the collection of important information. The

Courtesy of Underwood & Underwood

The King and Queen of Belgium, during the recent visit of their Majesties to this country, honored New York City by planting a tree in Central Park—a European beech. In the photograph taken at the time, the King in the uniform of a Lieutenant General can be seen standing just back of her Majesty. The King and Queen were greeted in the park by 30,000 New York school children before the tree planting

campaign previously begun against the hookworm has been continued, and the infection surveys were completed in São Paulo, Brazil, in Jamaica, and in Guam, while new work was started in Queensland, Australia, and in Minas Geraes, Brazil. The China Medical Board of the Rockefeller Foundation is constructing thirteen buildings for the Peking Union Medical College. Thirty-two instructors have been appointed on the medical faculty, and laboratory facilities are now ready. Since 1914 the large fund of $22,444,815 has been distributed among recognized agencies for special war service in camp and community welfare, medical research and relief, and humanitarian aid for Armenia, Syria, Belgium, France, Poland, Serbia, and Turkey. Plans for public health and medical education have been laid on broad international lines, and a new School of Hygiene and Public Health has been opened in connection with Johns Hopkins University. The Rockefeller Foundation fortunately has received a large share of the Christmas Day gift by John D. Rockefeller of $100,000,000 for public health and education throughout the world.

A GOLD medal has been presented to Dr. M. E. Conner, chairman of the Rockefeller Foundation Commission to Guayaquil, at a special meeting of the Guayaquil municipality, in recognition of his services and success in stamping out yellow fever in that region.

THE Rockefeller Foundation has established a division of medical education to which Dr. Richard M. Pearce, professor of research medicine in the University of Pennsylvania and member of the medical advisory board to the War Council of the American Red Cross, has been appointed director.

THREE trees were planted by distinguished visitors to New York City last fall in the "Honor Grove" of Central Park where the English elm, set out in 1860 by the Prince of Wales, later King Edward VII, still stands. On the afternoon of September 9, General Pershing, while attending a gathering in the park of 35,000 school children, put the first earth around the roots of a pin oak as a memorial to the men who lost their lives in the World War. A month later, on October 3, after addressing a similar gathering of school children, the King

and Queen of Belgium planted a European beech, and on November 21 the Prince of Wales set out an elm near the tree which his grandfather planted more than half a century before.

THEIR Majesties the King and Queen of Belgium, the Crown Prince, and their party visited the American Museum of Natural History on the afternoon of Saturday, October 4, and were received by Professor William K. Gregory and other members of the scientific staff present. The royal party visited several of the halls and viewed important exhibits, expressing a cordial interest in the Museum's work.

ON November 6 *Nature* celebrated its fiftieth anniversary with a Jubilee Number. The issue is occupied, for the most part, with retrospects by noted British scientists of fifty years' progress in various fields of learning, and an appreciation by Dr. H. Deslandres, vice president of the Academy of Sciences of Paris, of the founder and editor, Sir Norman Lockyer, who still continues his astronomical investigations at fourscore and three years. Fifty years have seen vast changes in science and scientific education in England, and of these changes *Nature* has been the faithful weekly chronicle. Sir Norman, in his "Valedictory Memories," records the encouragement in starting the weekly he received from various men of the past generation, including Mr. Alexander Macmillan, Sir Joseph Hooker, Huxley, and Tyndall. This was ten years after the appearance of Darwin's *Origin of Species* and at about the time when science began to take its first hold in public education in Great Britain.

A NEW magazine, the *Scientific American Monthly*, will succeed the *Scientific American Supplement*, which was established in 1876. This monthly will be devoted to current events in pure science and technology. It will officially represent the National Research Council by a special department and keep the public informed of the Council's activities. A particularly important feature of the new magazine, as it was of its predecessor, is the publication of translations of complete texts of significant articles appearing in foreign scientific magazines.

THE University of Paris has presented to the universities of the Allied countries a medal commemorating the achievements in the World War of the men of the respective institutions.

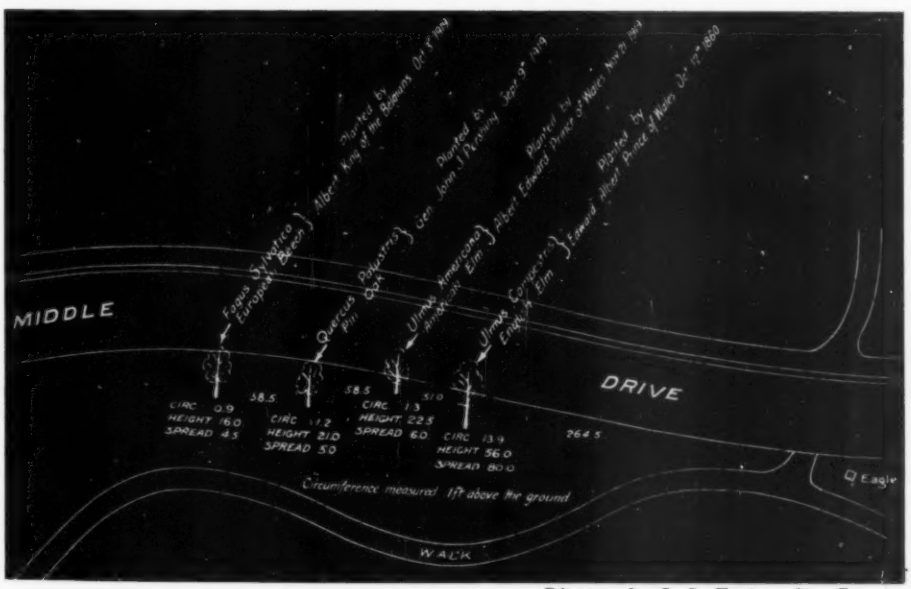


Diagram by J. S. Kaplan, City Forester

"Honor Grove" in Central Park, New York City, where General Pershing and three royal guests of the city have planted trees, lies along the east side of the Middle Drive between the Drive and the Mall.

A medal, presented to H.R.H. the Prince of Wales by the American Numismatic Society on the occasion of the Prince's recent visit to the United States

THE WOOD OF WHICH THIS CASE IS MADE COMES
FROM AN ELM TREE PLANTED DURING THE VISIT
TO AMERICA OF H.R.H. THE PRINCE OF WALES
AFTERWARDS EDWARD VII OF GREAT BRITAIN
AND IRELAND, AT 12.30 O'CLOCK NOON, ON
FRIDAY, OCTOBER 12TH, 1860, AT THE WEST
SIDE OF THE MALL, CENTRAL PARK NEW YORK CITY
THE MEDAL CONTAINED HEREIN IS PRESENTED
TO HIS GRANDSON H.R.H. THE PRINCE OF WALES
BY THE AMERICAN NUMISMATIC SOCIETY
DURING HIS VISIT TO NEW YORK IN NOVEMBER 1919

The medal was presented to the Prince in a case made of the wood of an elm which his grandfather, King Edward VII, at that time Prince of Wales, planted in Central Park, New York City, in 1860. A limb from this tree is on exhibition in Memorial Hall at the American Museum, through the courtesy of the New York Scenic and Historic Preservation Society and the Commissioner of Parks. The tree has grown to a height of 62 feet and at the time of its planting Central Park was only partly developed, and the whole region west of the park was "in the country." There were only a few houses and Manhattan Square, now occupied by the American Museum of Natural History, was still in its natural wild state, containing a small lake which contributed its waters to the lake in Central Park

DR. GEORGE ELLERY HALE, director of the Mount Wilson Observatory, foreign secretary of the National Academy of Sciences, and, during the war, chairman of the National Research Council, now holds the honor of being foreign associate of the Paris Academy of Sciences. Dr. Hale was elected honorary chairman in perpetuity of the National Research Council after his resignation as chairman, in recognition of his services during the war.

DR. CHARLES D. WALCOTT, geologist, and secretary of the Smithsonian Institution, has been elected foreign associate of the Paris Academy of Sciences to fill the vacancy left by the death of Dr. Élie Metchnikoff. Foreign associates are limited to twelve. This distinction has been previously held by five Americans, Benjamin Franklin, Count Rumford, Louis Agassiz, Simon Newcomb, and Alexander Agassiz.

A SUITABLE tablet has been erected on the grave at Philadelphia of Constantine Samuel Rafinesque, botanist and zoölogist. The grave had previously been unmarked. Rafinesque, born in Turkey, of French and German parentage, made his first trip to the United States in 1802 to collect botanical specimens in Pennsylvania and Delaware. He settled permanently in this country in 1815. Shortly after his emigration he occupied the chair of botany in Transylvania University, Lexington, Kentucky. Rafinesque wrote extensively in English, French, and Italian on his special researches.

A DEPARTURE in government recognition of science was evidenced in the appointment of Professor C. E. Mendenhall, of the chair of physics in the University of Wisconsin, as scientific attaché to the United States Embassy in London. The appointment, however, was a war measure only and has since lapsed.

THE proposal has come from various high scientific quarters to convert Heligoland into a bird sanctuary. The island is only a little rock of about one fourth of a square mile in extent, lying in the North Sea forty miles northwest of the mouth of the Elbe River. Although no birds regularly nest there except the English sparrow, it is a resting place for myriads of feathered travelers during the two annual migrations. As the island has been retained by Germany, however, with only the stipulation that the fortress be reduced, it will remain with that government to make this island, one of the greatest bird migration observatories of the world, a protected reservation.

AT Pilawin, southeastern Russia, the great game preserve of Count Potocki, one of the very few preserves in Russia, has been completely destroyed by the Bolsheviki, according to a letter from M. Pierre Amédée-Pichot of the French National Society of Acclimatation, printed in the *Zoological Society Bulletin*, New York. "Hundreds of deer, wapiti, European bison, and animals of all sorts were kept in 7000 acres of enclosed forest, which was part of a great tract of 30,000 acres. The place was invaded by 2000 Bolshevik Red Guards, who shot every animal, and left the carcasses to rot on the ground. The palace, its furniture, and collections were destroyed, and the servants and keepers of the game were tortured to death."

DESTRUCTION of the herd of elephants in the Addo Bush Forest Reserve (South Africa) was authorized by the provincial council of the Cape of Good Hope in the summer of 1919. This herd of from 100 to 200 animals was the last remnant of a variety (*Elephas africanus capensis*) which once ranged over the whole of southern Africa. The variety is characterized by a strongly arched forehead and enormous ears recorded as 4 ft. 5 in. × 4 ft. for a female 8 feet high (in the British Museum). The preserve at Addo Bush near Port Elizabeth has been opened up to agriculture by irrigation projects and the elephants naturally assumed that the improvements were for their benefit and acted accordingly. To confine the elephants would have required a thirteen-mile fence, costing at least £20,000, and in addition it would have been necessary to provide a water supply for them. All this makes it appear that African elephants are likely to fare worse than our American bison before the onrush of civilized man because they are so difficult to hold and care for in captivity.

THE Yucca House National Monument in the foothills of Sleeping Ute Mountains just

west of Mesa Verde National Park, Colorado, has been established by a proclamation of President Wilson. This monument contains the ruins of what was once an extensive Indian village. Mr. Henry Van Kleeck, of Denver, donated to the Federal Government the ten acres on which the ruins stand.

DR. CLARK WISSLER, curator of anthropology in the American Museum, has been elected chairman of the Section of Anthropology and Psychology of the National Research Council.

SIR E. RAY LANKESTER, the distinguished British zoölogist, has just completed fifty years' editorship of the *Quarterly Journal of Microscopical Science*.

THE National Academy of Sciences, Washington, has awarded a gold medal to Dr. A. Fowler, professor of astrophysics in the Royal College of Science and secretary of the Royal Astronomical Society, London, in recognition of his researches in astronomy.

MR. WILLIAM HENRY FOX, director of the Brooklyn Museum, of the Brooklyn Institute of Arts and Sciences, New York City, has been named a Chevalier of the Legion of Honor by the French Government.

International Control of Minerals is the subject of a pamphlet by C. K. Leith, professor of geology in the University of Wisconsin, issued by the United States Geological Survey. His purpose is, apparently, to state the problem in its various phases rather than to argue for or against it, and to put emphasis on the imperative need for study of the world mineral situation. The joint organization and systematic distribution of the mineral output of the world, brought about under pressure of war, has illustrated the possibility of international control. There are several fundamental facts in reference to the world's mineral supply which make it a matter of international concern: (1) About one third of the mineral output moves between nations; (2) In most instances it moves along a few restricted routes to a few centers, for instance, manganese is exported from three sources to four or five consuming centers; (3) No country is entirely self-supporting, for example, the United States lacks almost entirely nickel, platinum, and tin, and imports a large part of its aluminum, chrome, magnesium, and potash. Free trade in the metals instead of giving unrestricted opportunity has rather concentrated the materials in a few hands, a fact which at times hinders both national and industrial developments in other countries or localities. The question has accordingly arisen as to "the extent to which national interests can and will be subordinated to international interest" and the centralized control of the war maintained. There seems to be official sanction in Great Britain and France for such a control, the aim of which will be to insure an equitable distribution of the minerals of which there may be a world shortage, an adjustment of ship space, and an equality in the use of basic raw materials. An important aspect of the control would also be the part it might possibly play in the maintenance of peace.

THE International Research Council was opened at Brussels, July 18, 1919, in the presence of King Albert, by M. Harmignie, minister of science and arts, who welcomed the members to Belgium. Statutes for the Council were agreed upon and its objects outlined, according to *Science*, as follows:

"(*a*) To coördinate international efforts in the different branches of science and its applications.

(*b*) To initiate the formation of international associations or unions deemed to be useful to the progress of science.

(*c*) To direct international scientific action in subjects which do not fall within the province of any existing association.

(*d*) To enter, through the proper channels, into relations with the governments of the countries adhering to the council to recommend the study of questions falling within the competence of the council."

Brussels will be the legal domicile of the Council where it will hold triennial meetings, but the special associations affiliated therewith will probably maintain the custom of meeting successively in different countries. Between the triennial meetings the work of the Council is intrusted to an executive committee of five, consisting for the present of Professor E. Picard (France), Dr. A. Schuster (England), Dr. G. E. Hale (United States), M. Volterra (Italy), and M. Lecointe (Belgium). The general secretariat will be established at Burlington House, London, where the Royal Society has set aside a room for its use. All of the nations which remained neutral during the war were unanimously invited to affiliate with the Council.

DR. W. W. CAMPBELL, director of the Lick Observatory, headed the American delegation to the meeting of the International Research Council at Brussels. This delegation included representatives from the National Academy of Sciences, the American Astrophysical Society, the American Mathematical Society, the American Physical Society, the Naval Observatory, and the United States Coast and Geodetic Survey. As a result of the Brussels meeting two subsidiary societies came into existence, the International Astronomical and the International Geophysical unions. The American Section of the Geophysical Union was organized under the Division of Physical Sciences of the National Research Council and, as approved by this Division, will include geodesy, seismology and volcanology, meteorology and aërology, earth and ocean tides and mareology, and terrestrial magnetism. Mr. William Bowie, chief of the division of geodesy of the United States Coast and Geodetic Survey, was appointed acting chairman of the American Section.

PROGRESS in Negro education is reviewed in a recent Bulletin of the United States Department of the Interior by Dr. Thomas Jesse Jones, of the Bureau of Education of that department. Because of the exodus of Negro labor from the South the legislatures of southern states have taken a more active hand in this question, and Texas has even appointed a state supervisor of rural Negro schools. The great illiteracy of the southern Negroes was called to public attention by the examinations of Negro recruits in the late draft. Short terms (frequently only a few weeks), poor schoolhouses, and low salaries for teachers, however, will demand correction in many localities before the deplorable state of affairs can be ameliorated to any notable extent.

MEDICINE as a determining factor in war was discussed by Dr. Alexander Lambert in his presidential address before the 1919 meeting of the American Medical Association. The death rate in the Civil War of killed in action or died of wounds was 33 per thousand and of death by disease 65 per thousand. The American Expeditionary Force lost from wounds in action 31 per thousand and from disease only 11 per thousand. Malaria, which was the great scourge of the Civil War, has become almost negligible, while typhoid, which caused so many deaths in the Spanish American War and 22 per cent of the deaths in the Civil War, was chargeable with only 0.4 per cent of deaths in the World War. Pneumonia was the most dreaded disease of the recent war and to it are ascribed 85 per cent of all deaths from disease. The pneumonia, however, was part of a world-wide epidemic and beyond control. Dr. Lambert points out that, if the Medical Department is to increase its usefulness, it requires representatives on the General Staff, for authority must be united with responsibility. An example of what lack of authority entails is found in the case of meningitis which caused 4 per cent of deaths as opposed to 2 per cent in other wars. The increased morbidity and fatality were owing in this case, Dr. Lambert says, to overcrowding and bad ventilation of barracks, factors outside the control of the Medical Department.

THE fact that 34.19 per cent of the late draft in the United States was rejected from military service on the basis of physical inferiority raises serious questions in the field of public hygiene. Dr. J. Howard Beard, of the University of Illinois, analyzes in the *Scientific Monthly* the principal causes of rejection with a view to their preventability. All in all, the draft demonstrated that, if the country is to conserve its human lives as well as its other natural resources, it must turn its collective attention to adequate medical care and instruction in the schools. And, further, parents must be educated to save themselves expense by paying the family doctor a small sum to prevent, rather than a large sum to cure, illness in their children.

THE decoration of Commander of the Order of the Crown of Belgium was presented to President Henry Fairfield Osborn on November 20 by Colonel Osterrieth, chief of the Belgian Military Mission to the United States, representing the King of Belgium. Two volumes of the scientific researches made as a result of the Congo Expedition of the American Museum have been sent to King Albert, inscribed with the following legend:

"In grateful appreciation of the generous coöperation of the Belgian Government in

promoting this scientific research, the contributions in these two volumes representing the reports of the Belgian Congo Expedition so far as published, have been assembled for presentation to his Majesty, the King of Belgium, by the President and Trustees of the American Museum of Natural History on the occasion of his visit to America."

THE collection of big game trophies made by the late Captain F. C. Selous, D.S.O., who was killed in action during the British campaign in East Africa, has been presented by Mrs. Selous to the British Museum (Natural History). Captain Selous hunted during a period of forty years in Africa, Canada, Newfoundland, the southern Carpathians, and Asia Minor, and it is said that the collection is one of the largest ever brought together.

AN expedition to Africa under Mr. Edmund Heller sailed from New York on July 15 for Capetown whence it will proceed to Victoria Falls, from there entering the Belgian Congo and traveling eastward to Lake Tanganyika. Mr. H. C. Raven has been delegated by the Smithsonian Institution its representative on the expedition.

AN expedition to discover the sources of the Wahi Shebeli River which flows from Abyssinia through Italian Somaliland, left Naples during October. It was under the leadership of Prince Luigi, Duke of the Abruzzi, who was commander in chief of the Italian navy during the war, and has held both farthest north and highest altitude records, the one made in an attempt to reach the North Pole from Franz Josef Land, the other by an ascent of Mt. Austin, India, to a height of 24,000 feet. On a previous expedition to equatorial Africa he scaled Mt. Ruwenzori, altitude 16,801 feet.

THE British Imperial Antarctic Expedition under Mr. John L. Cope plans to leave New Zealand in July on the ship "Terra Nova." In announcing his expedition Mr. Cope says that it will aim to ascertain the position and extent of mineral deposits in Antarctica, to locate any waters abounding in whales, to investigate the meteorological and magnetic condition in the Ross Sea area and at Cape Ann, and to circumnavigate the Antarctic Continent.

THE death is announced of Herbert Ward, British sculptor, traveler, and author. Mr. Ward early went to Africa and was one of the survivors of Stanley's Emin Pasha Relief Expedition in 1888. He later turned to sculpture and exhibited in Paris many notable bronzes of African natives, some of which are now in the Luxembourg. As sculptor he received the decoration of Chevalier of the Legion of Honor. In 1916 Mr. Ward lectured in the United States for the benefit of the work of the American War Relief. Among his books are *Five Years with the Congo Cannibals* (1890), *My Life with Stanley's Rear Guard* (1891), and *A Voice from the Congo* (1910).

THE creation of a Mexican government bureau of archæology and ethnology has been announced by the Secretaría de Agricultura y Fomento. The bureau will carry on scientific investigations of the Mexican aboriginal cultures on the basis of a regional survey of the country.

THE erection of signposts, indicating distance and direction of watering places, through the deserts of southern California and Arizona under the direction of the United States Geological Survey has progressed rapidly. The water supply of the region is of strategic importance because it includes about 350 miles of the Mexican frontier. All the watering places of the region have been examined and 635 signs erected. All maps and data have been turned over to the United States Army for incorporation in the progressive military map of the United States. The work will ultimately be extended to all the western arid lands.

A COMPREHENSIVE outdoor course in biology was successfully conducted last summer by the department of zoölogy of Oberlin College under Professor Lynds Jones. Students of ecology were taken on an automobile trip to the Pacific Coast of Washington, including in their route the Yellowstone Park and part of the Columbia River. In the summer of 1920 the department expects to conduct a similar trip through Colorado to the Yosemite Park, California.

A MUSEUM of natural history has been founded in Yellowstone National Park by the Department of the Interior. Such

institutions will render important service in the utilization of our national parks as great outdoor universities.

THE United States Forest Service reports from California that the aviators who made daily flights over the national forests during the summer and autumn of 1919, discovered many incipient fires and thus prevented great loss. So valuable has this work proved that an air service may ultimately become a permanent part of the forest protection.

The Mineral Deposits of South America is the title of a new work by Benjamin L. Miller, professor of geology in Lehigh University, and Joseph T. Singewald, Jr., associate professor of economic geology in Johns Hopkins University. This book is the result of an extended trip by the two authors through South America, together with an exhaustive study of the literature of South American mineralogy of which they have collected the first extensive bibliography. After an introductory chapter on the economic geology of the southern continent there follow *résumés* of the mineral products and topographical and geological descriptions of the various countries together with detailed descriptions of localities important mineralogically. The book will serve as a valuable source of information for the merchant, investor, or prospector as well as for the student of South American geology.

WE learn from *Nature* that a conference of delegates from the Mediterranean nations met in November at Madrid to consult on and organize a plan for an international hydrographic and fishery investigation, particularly with reference to the life histories of food fishes. Four vessels will be at the immediate call of the organization, provided by the Prince of Monaco, and by Italy, France, and Spain, respectively. The results of this research will be published ultimately in French, Spanish, Italian, and English.

PROGRESS in the tanning and preparation of fishskins for commercial leather is reported by the *Fisheries Service Bulletin*. The United States Government Bureau reports that samples of the leather made from shark and porpoise hides is much superior to that previously submitted and is soft, pliable, and strong. The Bureau has developed a special net for catching sharks which appears well adapted to this difficult and sometimes dangerous sport.

THE United States Bureau of Fisheries has established an experiment laboratory in southern California to study the problem of preserving and canning fishery products. The methods developed will be placed at the disposal of the commercial packers.

A GIANT panda (*Ailuropus melanoleucus*) from eastern Tibet, one of the rarest of animals, has recently been placed on exhibition at the American Museum. The panda was discovered in 1869. In general appearance it resembles a bear and is about the size of our black bear, but it is really a distant relative of the raccoon. The striking black and white coat, short muzzle, and curious black patches about the eyes give it a very extraordinary appearance. Almost nothing is known of the animal's habits, but it is said that it feeds on roots and the young shoots of bamboo. It is believed that the specimen shown at the American Museum is the first brought to this country; the skin was purchased from Mr. Joseph Milner, a missionary, who had obtained it from some natives of Ta-Chien-lu, Tibet. Mr. Blaschke, sculptor in the American Museum preparation department, mounted the specimen.

AN interesting collection of birds, taken in northwestern Peru, has just been received at the American Museum from Mr. Harry Watkins, field representative of the department of ornithology. Several new forms, including a new genus of ovenbirds (*Hylocryptus*), are described in the December *Proceedings of the Biological Society of Washington* by Dr. Frank M. Chapman, curator of the department of ornithology at the American Museum. One of the most interesting discoveries is a breeding race of the killdeer, a common North American bird, which occasionally reaches extreme northern South America in winter.

A VALUABLE specimen of the great auk (*Plautus impennis*) has recently been added to the collections which are now in the American Museum, belonging to Dr. L. C. Sanford, of New Haven, Connecticut. The great auk or garefowl is an extinct bird formerly inhabiting the North Atlantic regions and

breeding on small islands off the coast of Iceland, on the Orkneys, the Hebrides, and in the vicinity of Newfoundland. It disappeared early in the nineteenth century through persecution by fishermen and sailors, who killed it for food, bait, and feathers. The last few survivors were taken by collectors about 1840. Only about seventy-eight specimens are preserved in the museums and private collections of the world, and accordingly skins have sold for very large sums.

BONES of the Virginia deer have been found in Indian shell heaps in Nova Scotia by the Canadian Geological Survey, and the identification has been confirmed by Dr. Gerrit S. Miller, of the United States National Museum. That the Virginia deer ranged so far north, except after its introduction into the province in 1888, had not previously been known.

ONE of the largest and most beautiful botanical gardens of the world is to be founded in Illinois, just outside the city of Chicago, by the Cook County board of forest preserve commissioners. This garden will be made by converting 2000 acres of the Palos Forest Preserve and so will inherit a natural tree and plant endowment in the green prairies and the wooded ravines along the Des Plaines River. Exotic flowers, shrubs, and trees will gradually be added.

THE first living specimen of the okapi to be brought out of the Congo country has been safely delivered to the Zoölogical Garden of Antwerp by the Commandant of the district of Bas-Uelé (Belgian Congo). The specimen was captured a day or so after its birth. At first it was fed on canned milk and then on the milk of a zebu cow, but since its arrival in Europe the young animal eats clover and other green plants. The Congo Expedition of the American Museum (1909–15) attempted to bring out an okapi, but the specimen captured died for lack of proper food.

THE first part of Volume I of the final report of the *Scientific Survey of Porto Rico and the Virgin Islands* was published September 26 by the New York Academy of Sciences. It contains a history of the Survey by Dr. N. L. Britton; a geological introduction, including a discussion of the major geological features, by Professor C. P. Berkey, to which is appended a new base map of Porto Rico by Dr. Chester A. Reeds; and an interesting description of the geology of the San Juan District, an area of about five hundred square miles on the northern side of Porto Rico, by Dr. Douglas R. Semmes. The 110 pages of text are supplemented by twenty-six illustrations, four plates, and three maps.

The Survey was instituted in 1913 by the New York Academy of Sciences in coöperation with the insular government of Porto Rico, the American Museum of Natural History, the New York Botanical Garden, and with the scientific departments of Columbia University and other institutions, for the purpose of prosecuting a thorough and systematic investigation of the natural history of the island of Porto Rico, and subsequently of the Virgin Islands. A large amount of data has been assembled and a great number of specimens collected. Important preliminary papers have been published in the *Bulletin* and *Memoirs* of the American Museum of Natural History as well as in other scientific journals.

The complete report will contain volumes devoted to anthropology, botany, geology, palæontology and zoölogy. These will give a most exhaustive and valuable account of the natural history resources of the islands.

THE American Ornithologists' Union held its thirty-seventh stated meeting at the American Museum, November 11–14. In connection with the meeting of the ornithologists and in celebration of the centennial of the expedition to the Rocky Mountains under the command of Major Stephen H. Long, the Museum arranged a special exhibit of specimens, manuscripts, drawings, and published volumes relating to Major Long's journey. Thomas Say and Titian Ramsay Peale accompanied that expedition which was the first American exploring expedition to which naturalists were officially assigned.

THE Children's Museum of Boston has received accessions to its endowment fund amounting to $25,000. A branch will be opened in coöperation with the Barnard Memorial in the crowded south end of the city.

THE bronze memorial to Lewis and Clark by Charles Keck, sculptor, a photograph of which was shown in the April-May number

of NATURAL HISTORY, was dedicated by the city of Charlottesville, Virginia, on November 21, 1919.

AN expedition to the island of Jamaica for living and extinct mammals, was undertaken in November by Mr. H. E. Anthony, assisted by Mr. Charles Falkenbach, both of the American Museum. No fossil vertebrates, except for a single skull of a marine mammal, were known from this island, but a consideration of the conditions in this and other West Indian islands made it appear highly probable that some land vertebrates formerly existed there, and the geology indicated that caves probably existed similar to those in Porto Rico and Cuba from which Mr. Anthony had secured such large and interesting collections of fossil mammals, and that they might also yield fossils. Preliminary reports from Mr. Anthony leave no doubt that this forecast has been verified, but the extent and character of the collections remain to be seen. The character of this fauna will be studied with particular interest, as it should throw further light on the sources of the fauna and the manner of its arrival on the islands. The geology of the West Indies indicates that the most probable place for a mainland connection, if the fauna arrived in that manner, is by way of Hayti, Jamaica, and Honduras. Obviously, if the animals did arrive in this way, the fauna of Jamaica ought to be more like that of the mainland than those of any of the other islands—more continental in type. On the other hand, if the animals, or rather their ancestors, arrived on the islands through the agency of storms, floating vegetation, or other accidents of oversea transportation, without the aid of any continuous land bridge, then Jamaica, as a rather small and isolated island, should have a more scanty and insular fauna than the larger and more central islands of Cuba and Hispaniola, perhaps even more so than Porto Rico.

MR. ALBERT THOMSON, of the department of vertebrate palæontology in the American Museum, assisted by Mr. George Olsen, carried on operations during the summer of 1919 in the great fossil quarry at Agate, Nebraska. From the richer part of the quarry a section was selected especially suitable to be preserved and exhibited at the Museum in the block. This block, showing sixteen skulls and corresponding numbers of skeleton bones within a space of 5½×8 feet, was skillfully lifted, boxed, and brought to the American Museum without damage. Its weight when boxed was about six thousand pounds. Several other valuable fossil specimens were obtained from the quarry and vicinity.

A SIGN of the renewed period of interchange between the American Museum and its scientific colleagues abroad is the gift of a series of skeletal casts of the Neanderthal man of Krapina, Croatia, which comes from the laboratory of Professor Gorjanović-Kramberger, director of the Geological and Palæontological Department in the Croatian Natural History Museum at Zagrab (Agram). These casts have been arranged with the other material dealing with the history of Neanderthal man in the center of the hall of the Age of Man at the American Museum.

MR. LOUIS L. MOWBRAY, who was connected with the New York Aquarium for a number of years, has lately gone to Miami, Florida, to take charge of a new aquarium which is to be erected there. On leaving New York he turned over to the American Museum of Natural History two important collections of marine fishes, made by himself, one from Bermuda and the other from Turk's Island in the Bahamas. These collections contain several species which have never been described, and others which are little known. Turk's Island is famous for the variety of its fish life but the species which occur there have never before been listed or adequately collected. The fishes from Bermuda are comparatively well known and are of particular interest as perhaps giving some key to the obscure laws which govern the dispersal of marine fishes. A certain similarity between the fish life in Bermuda and that at South Trinidad Island, which lies well off the Brazilian coast, south of the Equator, should be traced to similar oceanic isolation of each locality. The occurrence in Bermuda and Porto Rico of species not known elsewhere in the West Indies is interesting, and we find that certain fishes of the Mediterranean and eastern Atlantic occur there. It seems incredible that these should not also reach other West Indian islands. Distance is proved to be no

barrier to their dispersal. Possibly, however, there is some effective barrier in the trend of the ocean currents or it may be that, although they reach Bermuda, they are barred from waters farther south where they would meet a keener competition with allied forms.

A SURVEY through the Rocky Mountains for study of the nature of the folding of the earth's crust involved in the elevation of these mountains is reported on by Professor Rollin T. Chamberlin, of the University of Chicago, in the *Journal of Geology*. The line of the survey extended in a slight curve from near Lyons, Colorado, to the Grand Hogback at Glenwood Springs, so as to meet the various ranges at approximately right angles. This section of the Rockies (from the Great Plains to the Uinta Basin) was originally 140 miles in width and has been compressed into 132 miles, a shortening of only 8 miles. The section studied by the Survey was divided into thirteen parts and the thickness of the crust involved in the deformation was calculated for each section. The roots of the Gore Range reach to a depth of 87 miles and of the plateau near Glenwood Springs to 107 miles, very great depths when compared with the crustal deformation of the Pennsylvania Appalachian folds where the maximum depth is only 32 miles. Further comparison of the Colorado Rockies with the Appalachians brings out the very great amount of volcanic action there has been in the case of the former and the negligible amount in the latter. It is probably true that mountain formation in which there has been involved a thick shell of the earth's surface which has necessarily pushed downward into the earth great depths has always been accompanied by much outpouring of lava; and that the reverse has been true in the case of the deformation, however intense, of a thin shell which has pushed its roots but a few miles downward instead of several scores of miles. A theoretical division might be made of the earth's mountain ranges into thin-shell, shallow-rooted mountains which have had little volcanic eruption—the Alps, the Jura, Scandinavian chain, Scottish Highlands, Brazil range, etc.; and thick-shell, deep-rooted mountains with very great lava output—Colorado Rockies, Cascade Range, western Andes, and the Abyssinian Mountains.

A TOPOGRAPHIC mapping of the republics of Santo Domingo and Haiti has been undertaken under the supervision of the United States Geological Survey through appropriations made by the respective governments. It is also reported by the Washington Academy of Sciences that Cuba and Porto Rico are expected to join in the work. A Division of West Indian Surveys has been created for this emergency and Lieutenant Colonel Glenn S. Smith placed in charge. Survey parties have already begun work in the Dominican Republic.

AN exchange of professors between the University of Chile and the University of California has been officially ratified by the government of Chile through its Minister of Public Instruction, Pablo Ramirez. This is the first definite step in a plan by which the University of California will become a center for exchanges of professors with the leading Hispanic countries of the world and for study of the historic and contemporary problems of these countries. Dr. Charles E. Chapman, associate professor of Hispanic-American history in the University of California, will be the first exchange professor.

THOSE mammals of Australia which are now or in the past have been in the New York Zoölogical Park are the subject of a well illustrated paper[1] by W. H. D. Le Souef, director of the Zoological Gardens, Melbourne. The Australian mammalian fauna, with its dingo, kangaroos, wallabies, koala, bandicoot, wombat, Tasmanian wolf, Tasmanian devil, and platypus, is the most peculiar found on any continent, and is always of interest to the general visitor at any zoölogical garden. The New York Zoölogical Park has a representative collection of Australian mammals for which the paper by Mr. Le Souef will serve as an excellent guide.

A SCIENTIFIC application of micro-cinematography, similar in some ways to that discussed by Mr. Charles Herm in a previous number of NATURAL HISTORY, is presented by Professor Herbert F. Moore, in *Iron Age*. Professor Moore has designed a micro-cinematograph which is attached to a metal testing machine. With this he is able to take views of the change in microscopical

[1] *Zoologica*, Scientific Contributions of the New York Zoological Society, January, 1919.

structure of the metals undergoing tests and then use these photographs for study and lectures.

THE publication of a work on the osteology of reptiles, left in manuscript by the late Samuel Wendell Williston, professor of palæontology in the University of Chicago, has been intrusted to Dr. William K. Gregory of the American Museum.

DR. W. K. GREGORY has in press two important monographs in the *Memoirs* of the American Museum of Natural History, one describing the Eocene lemuroid Primates, the group of animals from which the later monkeys, apes, and man evolved, the other, a comparative study of the lachrymal bone in the Mammalia.

DR. LOUIS DOLLO, of the Royal Museum in Brussels, who is one of the senior palæontologists of Europe, is engaged, it is reported, in the preparation of a monograph on the fossil reptiles of the Congo. He has already published a number of special papers in this field.

THE second award of the Elliot Medal for the leading publication in zoölogy or palæontology was made by the National Academy of Sciences, Washington, to Mr. William Beebe, curator of birds at the New York Zoölogical Park, in recognition of his *Monograph of the Pheasants*. Professor Henry Fairfield Osborn of the American Museum presented Mr. Beebe to the Academy. In speaking of the *Monograph* Professor Osborn said in part:

"This is a profound study of the living pheasants in their natural environment in various parts of eastern Asia. There are nineteen groups of these birds: eighteen were successfully hunted with camera, with field-glasses, and when necessary for identification, with the shotgun. The journey occupied seventeen months, extended over twenty countries, and resulted in a rare abundance of material, both literary—concerning the life histories of birds—and pictorial, photographs and sketches. The journey extended over 52,000 miles; it ended in the great museums of London, of Tring, of Paris, and of Berlin, for the purpose of studying the type collections. Thus the order of the work was from nature to the museum and to man, rather than from man and the museum to nature.

"The *Monograph* covers the blood partridges, the tragopans, the impeyans, the gold and silver pheasants, the peacocks, the jungle fowl, and the history of the ancestry of our domestic fowls. It has important bearings on the Darwinian theories of protective coloration and of sexual selection, and on the De Vries theory of mutation. The full-grown male and female characters, the changes of plumage from chick to adult, the songs, courtships, battles, nests, and eggs of nearly one hundred species are included and systematically described. The illustrations are by leading American and British artists. The haunts of the pheasants are shown in the author's photographs ranging from the slopes of the Himalayan snow-peaks, 16,000 feet above the sea, to the tropical seashores of Java."

To the four great murals by Charles R. Knight in the hall of the Age of Man at the American Museum has now been added a fifth, representing the Pleistocene life of northeastern North America, with its characteristic giant beaver, deer, moose, and tapir, the remains of which are found along with those of the mastodon in the peat bogs and later cave deposits of the North Atlantic States. A sixth mural painting by Mr. Knight, above the western archway of the hall, represents the Crô-Magnon race of man, the artist of the prehistoric cave paintings and sculptures of France and Spain and the forerunner in western Europe of the higher modern types of man among whom civilization arose.

DR. PLINY E. GODDARD, curator of ethnology in the American Museum, has been elected a fellow of the American Academy of Arts and Sciences.

THE seventy-second meeting of the American Association for the Advancement of Science met in St. Louis December 29 to January 3 under the presidency of Dr. Simon Flexner. The retiring president, Professor John M. Coulter, delivered his address on the "Evolution of Botanical Research" and President Flexner gave a lecture, complimentary to the members of the association and affiliated societies and the citizens of St. Louis, on "Present Problems in Medical Research." The Association recommended, among other things, that in con-

nection with the Carnegie Endowment for International Peace, the British, French, and Italian equivalents of the American Association be invited to send delegates to the meeting to be held next year in Chicago. The Association also indorsed and commended the general purposes of the Save the Redwoods League. Dr. L. O. Howard, chief of the United States Bureau of Entomology, was elected president for the ensuing year.

ON Roosevelt Day, October 27, a number of lecture reminiscences were delivered at the American Museum in conjunction with the National Association of Audubon Societies. Addresses on various aspects of Roosevelt's interests in natural history were delivered by President Henry Fairfield Osborn, of the American Museum, Mr. T. Gilbert Pearson, secretary of the National Association of Audubon Societies, Dr. Frank M. Chapman, curator of ornithology in the American Museum, Mr. George K. Cherrie, representative of the American Museum on the Roosevelt Expedition to South America, Mr. Carl E. Akeley, and Mr. Ernest Thompson Seton.

THE New York *Times'* "Review of Books" reports the activity of John Burroughs in the memorial exercises in honor of Theodore Roosevelt. He journeyed from his home to Garden City, Long Island, to plant a "Roosevelt tree" in the gardens of the Country Life Press, selecting a sugar maple and setting it near the evergreen tree which John Muir planted several years ago. Mr. Burroughs is spending the winter in southern California.

THROUGH the courtesy of Miss Josephine M. Stricker, who acted as Theodore Roosevelt's secretary during the years 1916 to 1919, NATURAL HISTORY has become acquainted with Roosevelt's early refusal and final acquiescence to Sigurd Neandross' request—seconded by Mr. Anthony Fiala—for sittings for a portrait bust (reproduced as frontispiece, page 510). Unfortunately the bust was never completed because of Roosevelt's sickness; in fact, the sculpture is so true to life in certain views as it stands, that it very perceptibly portrays the low state of health and somewhat troubled condition of mind of the great American in the last year of his life and the fourth of the heart-rending years of the war.

MR. LAURENCE V. COLEMAN has returned to the American Museum as chief of the department of preparation. Since Mr. Coleman's connection with the department of public health of the American Museum in 1915–16 he has been studying zoölogy at Yale, Harvard, and Woods Hole and has given nine months' service in the United States Army as chemist.

SINCE the last issue of NATURAL HISTORY the following persons have been elected members of the American Musum:

Patrons, MRS. DAVID J. KELLEY and MR. W. B. DICKERMAN.

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